THE INTEGRATION OF ENVIRONMENTAL EDUCATION INTO THE PRIMARY SCHOOL SCIENCE CURRICULUM IN TORORO DISTRICT

BY

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DECLARATION

I declare that this dissertation is a result of my own independent research effort and investigation. It has not been submitted to any other institution for any award.

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APPROVAL

This dissertation has been approved and submitted for the award of the Degree of Master of Education of Makerere University with my authority as a university supervisor.

Signed …… Date ……

DR. JOSEPH OONYU

DEDICATION

This work is dedicated to All My Family Members who gave me all the support and encouragement throughout the entire course. I know you missed me a lot each time I was working on this research instead of being with you.

ACRONYMS

DOSATE	-	Department of Science and Technical Education
EE	-	Environmental Education
ESA	-	Education Standards Agency
NEMA	-	National Environment Management Authority
IUCN	-	International Union for Conservation of Nature
NFAL	-	Non-Formal Functional Education Literacy
MoG & CD	-	Ministry of Gender and Community Development
NCDC	-	National Curriculum Development Centre
UNESCO	-	United Nations Education, Scientific and Cultural Organisation
UNEP	-	United Nations Environment Programme
IEEP	-	International Environment Education Programme
MECDP	-	Mt. Elgon Conservation and Development Program
MoE&S	-	Ministry of Education and Sports
CPD	-	Continuous Professional Development
CVI	-	Content Validity Index
Ag	-	Agree
Da	-	Disagree
Un	-	Undecided
PTC	-	Primary Teachers' College

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ABSTRACT

This study was on the integration of Environmental Education into the Primary School Science Curriculum. The purpose of the study, was to assess ways in which EE integration had been done in the Integrated Science Syllabus for primary schools: methods teachers used to integrate EE aspects in Science teaching, the constraints, challenges and limitations teachers face in teaching the Integrated Science Syllabus; and how all these affected the learners' perception of EE, their environmental literacy and participation in conservation activities.

The study adopted a descriptive cross-section research design of exploratory nature. The population of study included: curriculum developers who participated in producing the Integrated Science Syllabus, Inspectors of Schools both in Tororo Municipality and West Budama County, officials of Education Standards Agency (ESA), National Environment Management Authority (NEMA) District Environment Officer - Teachers in the study areas, male and female primary school pupils in each of the classes primary six and seven. The study involved fifteen schools: five of the schools were from the municipality while ten were from rural area. Respondents were purposively selected and frequencies, percentages and chi-square were used to analyze the data that was obtained.

The findings revealed that there was satisfactory content integration of EE in the primary science syllabus. Most of the respondents were satisfied with it. The themes and topics of science where EE had been integrated were mainly components of the environment, environmental degradation, energy resources in the environment and science at home and community. Integration of EE was also done in Human Health, Weather, and Water Cycle. However, more content integration of EE aspects in the primary science syllabus was still needed to cover all the topics. It was found that there was very low integration of values, skills and conservation practices, especially in the way teachers taught science.

Findings show that most teachers, headteachers, inspectors, ESA and NEMA officials had satisfactory concept of EE. This is shown by the high percentage of responses of the attributes of EE those who agree to the provided attributes of EE. However, there was also a high

percentage of 88% of teachers who expressed that the central problem of teaching EE practically is time wasting and requires many other resources.

The teaching methods and resources for the lesson in rural and urban primary schools were ineffective or very ineffective, and thus the methods for teaching EE in science were poor. However, the situation was found worse in the rural schools as compared to the counterparts of the urban. The methods teachers used in the observed lacked learner active participation and tended to emphasize content more than the practice. The major challenges and limitations encountered by teachers in the teaching of EE in integrated science syllabus were lack of trained personnel in EE, lack of funds, inadequate instructional materials, lack of reference books, lack of motivation, limited time for lessons, schools have small land and low interest by pupils in EE.

In conclusion, the study established that there satisfactory integration of EE content into the primary science syllabus learners'materials. However, efforts could be done to include EE in all themes and topics. Teachers need to improve upon the methods so that EE integration at the level of values, skills and conservation practices are integrated well in the science curriculum. This is quite possible since the teachers have satisfactory perception of EE and its integration. The study also established a number of challenges teachers face when integrating EE. Some of the challenges require teacher support while others are of management nature and require Ministry of Education, and Sports action.

It is recommended that further integration be done to include values, skills and practices. In order to help teachers understand well the environmental concepts and issues in primary science syllabus, the following should be done: provide non textbook materials, orient teachers on EE concepts, provide environment modules, incursion of EE in PTCs, guide them to produce integrated lessons, writing primary teachers' source book and provide enough materials on EE. For effective teaching of environmental issues in integrated science syllabus, there is need for enough textbooks and more trained teachers. A number of methods for teaching EE aspect in integrated science syllabus need to be adopted in those schools, which

neglected to use them. These included discussion and observation, experimentation, demonstration, field trip, excursion, project methods, and explanation, in order of importance.

CHAPTER ONE
INTRODUCTION

1.0 Historical Background

Environmental Education (EE), for a long time has been viewed as a critical step in the process of creating an environmentally literate population, leading to the development of knowledge, changing attitudes and behaviors of a population and as a process to a more environmentally sustainable way of life (Holt, 2003). Several definitions have been put forward since 1970s, especially when the world community became increasingly concerned with the term Environmental Education (Muthoka, et al; 1998).

Many definitions of EE have been advanced, but all of them are based on the one adopted at the International Union for Conservation of Nature (IUCN) and Natural Resource (1970). EE was defined as: "the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man (humans), his culture and his biophysical surroundings." In this definition, EE places emphasis in the nurturing of attitudes, skills and values, which can be translated in practices by learners. It also implies the conservation and sustainable management of the resources in the environment.

People acquire environmental knowledge and awareness from a variety of sources. For instance, people may receive unstructured, informal and non-formal education through interactive participation in environmental education in their family, society media and social interactions. EE can also be given in a formal setting through a structured EE curriculum within a school system. In Uganda, EE has been taught to adults through the Non-Formal Functional Educational Literacy (NFAL) curriculum (MoG & CD, 1999) the society also get EE information from the print and electronic media. Whatever the approach, the role of a lead person-teacher or facilitator is important. His/her accurate concept and perception of EE is vital in guiding its learning activities.

In this study, Environment Education (EE) was considered to mean a set of learning guidance given to school learners by their teachers on their surrounding. Such guidance should bring out the following EE attributes; development of awareness; content knowledge, skills, values, attitudes, conservation practices and sustainable utilization of resources in the surrounding. The study set of guidance therefore, referred to in this study is found in the primary science syllabus of the Primary School Curriculum, Volume One, 2000.

In Uganda, EE is taught at various level of the formal education sector. It has been integrated into various subjects of the primary school curriculum. For instance, EE has been taught into different subjects such as Primary Science, Social Studies and other subjects of the curriculum (NCDC, 2000). The Primary School Curriculum encourages an integrated approach to teaching of EE aspects within the different subjects.

In general terms, integration means putting or bringing parts together. It was also taken to mean making something absorbed or fused into another. This study focused on the way aspects of EE are fused into the primary science syllabus at the objective setting, content framework, classroom teaching methods and learning activities used by teachers. Such putting together or integration, as referred to in this study, should help in the achievements of the following EE attributes: development of content knowledge, skills, values, attitude and conservation practices.

In primary schools, co-curricular activities may include EE related club, visits to environment learning centres such as Mt. Elgon Explanation Centre, Uganda Wildlife Education Centre and any of the national parks. According to the Mt. Elgon Development Project Report (1996), these kinds of approaches have been found useful in developing EE attributes in the children. This was because such an approach was geared towards individual holistic development. This ensures that the intellectual, spiritual, emotional and physical needs of the learners are catered for.

It is hoped that the integrated science syllabus, which has environment components, should enable the primary school pupils acquire environment literacy and use the modern scientific

knowledge, skills, values acquired to improve their way of living. This will provide an indicator and a confirmation that pupils have acquired functional environment literacy. All topics in the science syllabus are compulsory for all learners in the primary school. This gives each learner the opportunity to develop all the knowledge and skills, value and attitudes meant to be developed in the various aspects of environment education within the science syllabus.

The Primary School Science Syllabus within Volume One of Uganda Primary Curriculum was launched and adopted for use in 2000 in all Uganda primary schools. The integrated science syllabus, therefore, has been operational for the last eight years. This study focused on the integration of environment aspects into Primary Science Syllabus as a major carrier of EE contents. Through the implementation of the science syllabus, the integration of content knowledge skills, values, past experiences and the newly acquired ones is possible for learners.

There has been a study (Oonyu, 2003), to assess teachers' perceptions of the major constraints to the teaching of EE in districts of Pallisa and Kumi. Other related studies and works have been done on teachers' awareness, attitudes and participation in EE in other different districts in Uganda. Examples of such studies include those by Bunoti (2002), Mugyenyi (2003), Asino (2007) among others.

However, it is not known if the perception of the learners can be influenced by the perceptions of their teachers on EE. Since the launch, there has not been any specific study to evaluate how well Integrated Science Syllabus that carried the EE aspect is performing in the primary school systems; neither has there been a formal and specific study to establish the extent and impact of integrating EE in other career subjects in the primary school curriculum. It is therefore not known for certain the magnitude of integration of knowledge, skills, values, curriculum content, practices and experience and how all these influence on children's learning EE and their participation in conservation activities.

It is important to assess what EE concept exists among teachers; what methods teachers use to bring out necessary integration among learners; and what constraints are associated with teaching of Integrated Science, particularly the EE aspects.

1.1 Statement of the problem

Integrating EE into the science syllabus can enable young learners at primary age form the correct concept of EE, develop knowledge, skills, values and positive attitudes towards the environment. This in turn would enable them care for it and sustainably utilize it to improve their lives. As a result, learners would exhibit the characteristics of environmentally literate population. Since its launch, there has not been any specific study done to assess the achievement of the attributes of EE by primary school learners. This knowledge gap raises a number of questions. For instance: whether the syllabus with the inclusion of EE helps to bring out the concepts and the meaning of EE among teachers and thereby improving upon the learners' concept of EE; What methods are being used when teaching EE aspects and how this strengthens learners' participation in environment conservation activities; what challenges and limitations are being encountered in integrating EE into the integrated science syllabus with resulting impact on learning of it.

1.2 Purpose of the study

The purpose of the study was to assess the extent to which EE content, objectives and methods had been integrated into the primary science syllabus and the perception teachers had on integration of EE, the challenges they faced and how they influenced the achievements of EE attributes. Examples of the EE attributes being considered include: development of knowledge, skills, values, attitudes and increased participation in environment conservation practices.

1.3 Objectives of the study

The study addressed the following specific objectives:

1. To determine the extent to which integration of EE has been done in the science curriculum.
2. To determine teachers' perception of EE and its integration in primary school science curriculum.
3. To establish whether the methods teachers used in integrating EE helped in the achievements of the EE attributes.

4. To identify what challenges and limitations teachers face in integrating EE in the primary school science curriculum.

Research Questions

The research, therefore set out to answer the following questions:

1. To what extent was EE integrated into the primary science curriculum?
2. How did the teachers perceive the integration of EE into the primary science curriculum?
3. How did the methods teachers used help in the achievement of EE attributes?
4. What challenges and limitations did the teachers face in the integration of EE in primary school science curriculum?

1.4 Scope of the study

This study was confined within the present primary integrated science syllabus in the volume one curriculum, that was launched in 2000, with specific focus on the EE aspects.

Geographically, the study was limited to government aided primary schools in West Budama County, in Tororo District, for the rural setting and Tororo Municipal Council schools to provide for the urban setting. These two areas enabled the researcher to capture adequately both the rural and urban perspectives of EE implementation in primary schools.

In terms of the time scope, the study considered the period since the launch of the current volume one primary school curriculum of 2000 in the Integrated Science for primary schools was included.

1.5 Significance of the study

The results of the study were hoped to provide positive backwash effects by helping the National Curriculum Development Centre (NCDC) to refocus on curriculum development process as it may identify gaps in the curriculum development process, planning and designing, especially in the inclusion of what may be new curriculum related issues. The study could be useful to NCDC in highlighting the importance and use of end-means; situational and critical analysis perceptive in development of curriculum. This is especially important in curriculum

review activities of subsequent years. It was also expected that study would provide what challenges the Ministry of Education and Sports should deal with at curriculum development and implementation process.

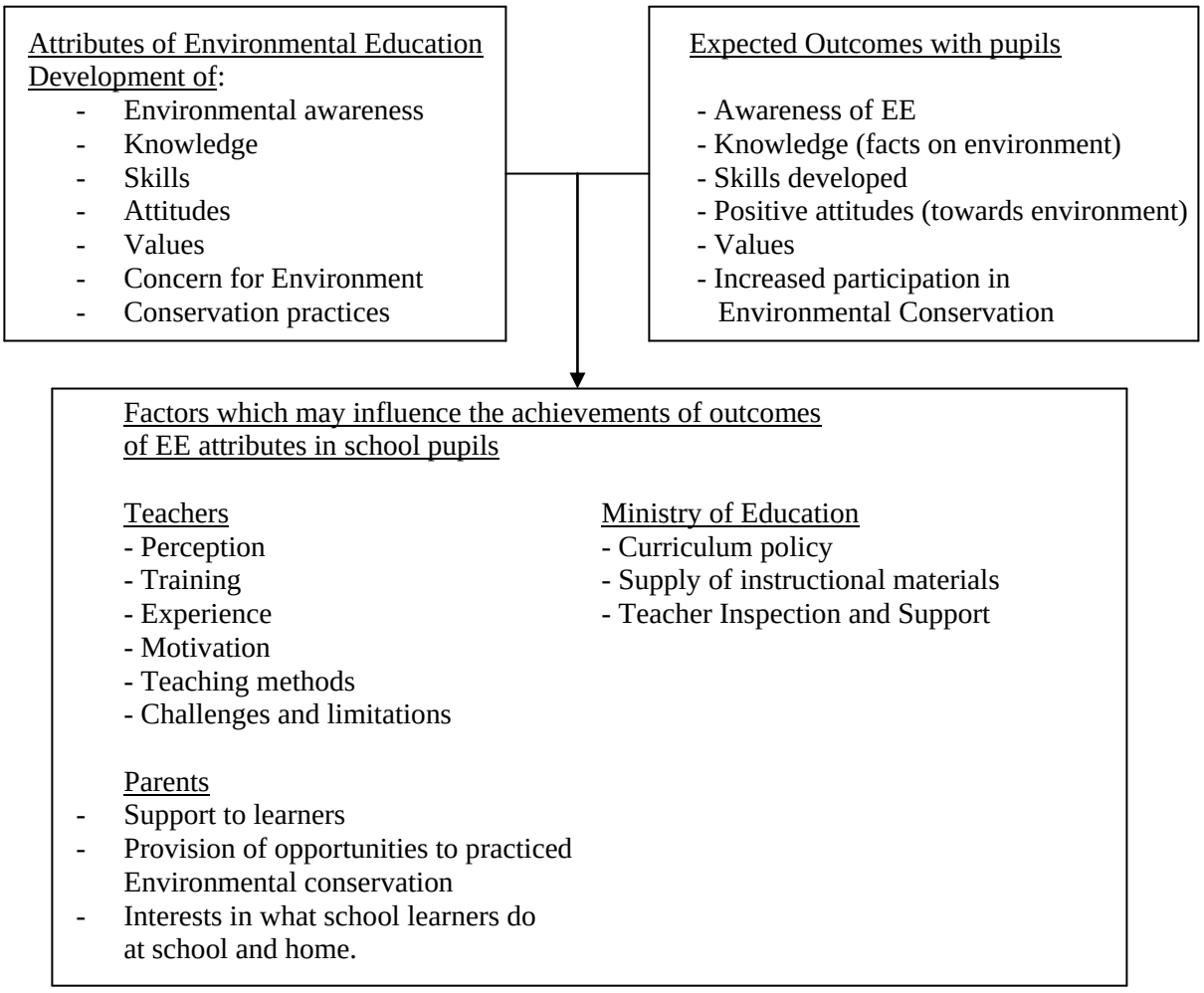
Conceptual Framework

This study was based on the conceptual framework of the relationship between the attributes of EE on one hand and expected outcomes which should be seen on the learners of primary science on the other. Attributes of EE at primary school level include:

Creation of environmental awareness among learners.

Development of knowledge, skills, attitudes, values, concerns for environment and participation in environmental conservation practices.

Attributes and the Expected outcomes of EE in school learners



Adopted from Constructionism theory of learning outcomes

Therefore, a successful implementation of EE aspects in the primary science syllabus has been expected to yield the following outcomes within learners: awareness of environment, knowledge of facts about environment, development of skills, positive attitudes and values which will support learners' increased participation in environmental conservation practices.

The study, however, considered the following extraneous factors which may influence the relationships between the EE attributes and the expected outcomes with the pupils. Such factors are broadly categorized under teachers, parents and Ministry of Education and its influence on curriculum formulation and its implementation stages.

As further shown in figure 1 above (conceptual framework), the EE aspects integrated in science syllabus were aimed at helping learners to develop the correct perception and become environmentally literate.

These outcomes form the ultimate goals of learning EE in the primary schools. In turn, the expected outcome and the impact of the program should be used to influence Ministry of Education and Sports policies on curriculum issues and support its development and the implementation stage.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of related literature which explored, in brief, the origins and developments of environmental education. It describes integration of environmental education in schools with particular focus on the primary schools. It also pointed out the views and perceptions which people, particularly teachers, have on integration of environmental education into school curriculum. The literature review explored the methods teachers used when integrating environment education into career subject in order to achieve the EE attributes. The literature review further looked at the challenges and limitations teachers faced in integrating environment education.

2.1 Origin and development of environmental education

Environmental education evolved in 1978 as a result of the concern raised, especially by ecologists in 1960s and 1970s about the degeneration of the environment. Environmental issues and problems had resulted into the Stockholm Conference in 1972. At this conference, it was agreed that an immediate action be taken, based on international understanding and cooperation.

In 1991, UNESCO and UNEP set up IEEP with the broad guideline for the programme to be interdisciplinary in approach, in school and out of school activities. The programme was intended to encompass all levels of education and directed towards the general public (UNESCO – UNEP, 1991).

The Stockholm Conference was followed by Belgrade Workshop, which in turn was followed by an international conference in the Russian City of Tbilisi in 1977. These conferences and workshops helped to specify the actual nature of environmental education by laying down its aims and characteristics as well as strategies to be adopted at the national and international levels. The objectives and guiding principles for environmental education were formulated at the Tbilisi Conference and are internationally accepted (UNESCO – UNEP, 1991). The

objectives were summarized into five (5) broad aspects such as: awareness, knowledge, attitudes skills and participation.

According to the Rio De Janeiro Conference Report (1992), 108 governments, represented by their heads of state, adopted three major agreement aimed at changing the traditional approach to development. Among these was the Agenda 21, which is a comprehensive integrated programme for global action in all areas of sustainable development. Further guidance on EE could be sought from the Rio Declaration of Environment and Development, which is series of principles defining the rights and responsibilities of states concerning environment and development.

In Uganda, environmental education was practiced informally in pre-colonial times. However, at present, activities of EE are guided by strategies, policies and statutory instruments such as: the 1995 Constitution of the Republic of Uganda, the Government White Paper on Education Policy (1992), the National Environmental Education Strategy for formal sector (1996) and the Uganda Primary School Curriculum, Volume One (2000).

With all these and other support for EE, a lot was expected in the development of the curriculum, its implementation in schools and suitable assessment schemes, which focus on learners' knowledge, skills, attitudes, values, participation in conservation practices and sustainable utilization of the environment.

2.2 The Integration of Environment Education into the Primary Science Syllabus

In implementing the Rio De Janeiro Agenda 21 and other conventions, Uganda came up with a number of programs, such as the Mt. Elgon Conservation and Development Program (MECDP), where EE was infused into development activities. Lessons we learnt from MECDP is of an integrated approach to conservation activities. This created awareness, generation of knowledge, formation of positive attitude towards environment, developed and sharpened skills relevant to the different disciplines that now drive individuals into corrective participation in restoration activities. This kind of lesson gave a strong basis for the integration approach to EE in formal education sector.

Milbrath et al, (1990), examined environmental education in the formal setting and suggested that the experiences used to teach environmental concern be broadened to be multidisciplinary, to involve basic concepts and principles of mathematics and science, be problem-oriented, address local and global issues and involve hands on contact with nature. It was not the formal setting or the information that is shared within the setting that seem inadequate, but the limitation of environmental education within a discipline-based approach within this formal structure that appeared to prohibit the attainment of the outcomes of informed and politically active citizenry.

However, Heimlich, (1993), emphasized that in EE, the educator or interpreter would define what would be available, disseminated, or aired for the learner, which correlates with the objectives of the program. The learner, then, would control the means of learning through choosing to listen, to read, to participate in the nature walk, or read the signs on the self-guided tour. Heimlichs' view tended to suggest the importance of involving the learner in the choosing of learning contents, media, methods and pace. The teachers' role was to provide the necessary learning opportunities, but it is not certain as to whether these learning opportunities were provided by the teachers. Thus this research was carried to establish if the teachers did this with their learners.

The Tbilisi Conference Report, (1977), indicated that the criteria for the development of environmental education in schools and colleges constitute the following: aims of education; attitudes and values; content of environment education and teaching methods.

However, it is not clear as to whether these were focused on when preparing and delivering EE in the primary science syllabus, thus warranting investigations in this area. Tabaro, (1997), asserted that the development of curriculum guidelines within the national environmental education strategy indicates what the curriculum expected to guide in EE, based on aims and objectives, which is a basis for having curriculum guidelines. He further indicates steps that would be taken in developing the required guidelines, such as the identification of career content topics for EE in various subjects; formulation of objectives for EE in the career subjects; exploration of learning/teaching media and situations for EE in various carrier

subjects; and the evaluation of EE instructions. Both the Tbilisi Conference report and Tabaro assertion give us the general approach of integrating EE. It is not known for certain if this general approach was used in integrating EE into primary science syllabus, hence the need for this study.

Cormack, (1997), indicated that the curriculum at primary level gave some basis for integrating EE in the teaching of most subjects in offer. For example, the science syllabus in its aims and objectives included statements like: to expose the pupils to the natural environment to enable them acquire practical experiences and favourable attitudes and to encourage the pupils to apply scientific and health principles and attitudes in solving some of the everyday problems in their environment. However, there is no known study which established whether objectives of the primary science syllabus and its implementation reflected these aims and objectives. Hence the need for this research.

Baron, (1994), emphasizes that Integrating Environmental Education and Science is designed to encourage environmental literacy and responsible environmental behaviour, and to assist curriculum developers and teachers in designing and implementing such a curriculum. Thus, while integrating, important consideration should be on the goals of environmental and science education. He further identified key content elements and suggested various ways to organize the curriculum.

Other EE advocates like the Department of Education (2003) pushed for EE to establish economic efficiency through environmental education that would be achieved through integration of values and concepts within the curriculum. This therefore called for critical examination of the existing instructional materials and methods if they provide the minimum learning competences. The Department further regarded it necessary that these be broken into simpler ideas or messages, that would be more understandable and achievable through the following sub messages:

Effective utilization of resources at and lower costs of production. Proper conservation of resources that would help maintain ecological balance and lengthen the life span of resources,

and ensure that people reserve resources in the environment for future needs. Ensure that people have responsibility to develop their own potentials and existing environment resources for their use and to share the same with others.

For Environmental Education, the main message is that a healthy environment makes a healthy man. The sub-messages are that: There are many ways of keeping the environment healthy. It is man's responsibility to keep his environment healthy. Keeping the environment healthy lessens the adverse effects of pollution to man and the environment.

Basing on such framework of main and sub-messages, UNESCO (2006), asserts that curriculum developers and teachers have a crucial role in devising and implementing practical learning activities that provide solutions to the current problems, such as environmental degradation. Therefore, they should be aware of the concept and challenges of and have deeper understanding of sustainable development. These are important sub messages which would be critical for learners at primary school level. However, it is not certain if the integration of EE in the primary school science curriculum content development or teaching methodology allows for the development of these sub messages.

Heimlich, (1993), observed that when teaching about the environment, the learning activities were often constructed in awareness that required the use of the physical environment surrounding the learners, or moving into nature and the natural settings to explore issues of the environment. He further suggested that teaching approaches were sometimes labelled "non-formal and that the same label was given to many environmental education efforts that had little to do with formal schooling.

However, it is not clear whether teachers of primary science syllabus which has EE use the approach which allows learners to use the physical environment. Therefore, this study was to establish the kind of methods teachers use for teaching EE in primary schools.

Seaman and Fellenz, (1989), when looking at the content of the curriculum emphasized that it was important to integrate topics or subjects into other topics or subjects when implementing

the EE curriculum. They further suggested that the content could dictate the method of presentation to be used, teachers' competences, the specific evaluation efforts, learning practices, equipment and facility arrangements, time required and other tangible outcomes. The content may also dictate the teaching strategy to be used, including the non-formal education in the formal schools. But it is not certain as to whether these had been adopted in the integration of EE in the primary school science syllabus.

All the views in this section pointed out the integration of EE at objective level, content level, and the teaching methodologies for its implementation. Each level requires to be handled well in order to achieve the attributes of EE in school education.

2.3 Teachers' Perception on the Integration of EE in the Primary School Science Syllabus

Teachers' perception on the integration of EE in the primary school science syllabus relates to what they understand by environment education, its aims and objectives and the attributes. What teachers perceive EE to be will guide content methods and activities they use for teaching it in schools. In turn, this will influence how and whether they integrate it at objective, content or implementation level.

According to Rose Hulman, Institute of Technology & Carnegie Mellon University (2003), students and teachers, including any other person needed to develop an understanding and appreciation of the key dimensions of environmental issues and that environmental curriculum provides a good ground not only for teaching issues and the relevant science and technology but also provides the ideal setting for teaching in context, which was recognized as an essential feature of education in a complex society (Yager, 1996).

In support of above idea, EPA (http://www.epa.gov/enviroed/P, (2006), emphasized that environmental education (EE) increases public awareness and knowledge of environmental issues and challenges. Through EE, people gain an understanding of how individual actions affect the environment, skills that they could use to weigh various sides of the issues and become better equipped to make informed decisions about the environment. EE also gives

people a deeper understanding of the environment, inspiring them to take personal responsibility for its preservation and restoration.

Also, Abid, (2003), observed that Environmental Education is critical for promoting sustainable development and improve the capacity of people to address environment and development issues like; deforestation, water pollution, air pollution and poverty. It also involves knowing the breadth and the depth of issues that are important in personal life. Such were the perceptions other people had about EE. But it was not certain if teachers had a similar perception of EE and hence the need for this study.

According to Shen, (1975), the objective of teaching EE was to enable students understand and assess the "practical" environmental information and the "civic and cultural' information, including social and individual behaviour, ethics and regulation so as to derive the evaluative judgment needed for informed teaching and learning EE.

Tobias (1990), (1992) and Roser (1990), pointed out the short-comings of the narrow disciplinary, hierarchical, subject-centered (as opposed to learner-centered) and monolithic approach to the teaching of EE. They cited the failure of approach and to place the EE skills and knowledge in the context of relevant issues as reasons for the disenfranchisement of capable students from engaging in learning and applying EE, and for the absence of environment literacy among the majority of the educated public. Environmental courses provide a natural setting to teach scientific and applied principles, and decision – making skills and to promote cooperative learning and the higher skills of analysis, synthesis and evaluation. The obvious relevance of the subject area elicits high degrees of participation and active development of critical thinking skills, group process and communication skills. The above citations emphasize the need for relevant approach to EE and the importance to provide correct setting in order to achieve important attributes of EE to learners. It is not clear for certain if the teachers have this perception of EE, hence this study.

Rose Hulman Institute of Technology & Carnegie Mellon University, (2003) also emphasized that the student should learn not only the facts but also develop an understanding about the

context, processes and their strengths and limitations. Thus, conceptual framework so students can learn as issues emerge and paradigms change in the future. At different levels of student learning, different relative emphases may be placed in the domains, knowledge, problem definition and solving ethics judgment and decision making and team work depending on the student's knowledge, developmental stage and interests. Aspects such as this need assessment (problem definition), decision-making and ethics which have received attention recently as central components of EE are naturally brought into this "education as design" framework.

In addition to the cognitive goals cited above, this approach also has value in the affective domain which tends to create the link between concept of EE and pedagogical practices. Research on educational psychology has shown that "perceived self-efficacy" is a key to choice, performance and persistence of all students in any subject area, including EE (Betz 1983, 1990). Design provides a setting in which these aspects can be fostered as an inherent part of the educational setting, and thus engender self-efficacy even in underrepresented populations of students. Pedagogical and motivational factors such as teaching knowledge in context, learning through trial and error, extended periods for observation and testing, seeing the use of the material learnt, ethical responsibility as part of the goal, can be built into the design paradigm for learning.

Mastrilli (2005), considered teacher preparation programs as important in the development of teachers' perception and understanding of environment. Rosalyn McKeown-Ice in Mastrilli (2005) found out that the status of environmental education (EE) as a component of pre-service teacher education programs was unknown on a national level. This provided important information on a national level concerning teacher preparation in EE within Uganda. Mastrili's considerations of teacher preparation is important in shaping up the perceptions teachers would have on EE. Therefore this study attempts to find out if the training the teachers went through included EE, especially since the implementation of EE strategy plan of 1997 emphasized teacher education program.

2.4 Methods used by Teachers in the Integration of EE to Achieve its Attributes

Abid (2006), asserts that quality in education comes from partnership between learner and (teacher) facilitator. It rests on collaboration and the creation of confidence between learner and the facilitator, so that each partner can learn how to improve. Quality teaching in environmental education has two dimensions: the first is to develop innovative strategies, new skills, capabilities and understanding of learners about the environment, environmental issues and conservation: the second dimension is the change in the learner's knowledge and skills due to contextually relevant, learning experiences. Both dimensions are dependent on the pedagogical approaches the teacher (facilitator) chooses to use. Abid relates teachers' perception to the quality of teaching which brings closer relationship between teacher and learner in order to achieve the attributes of EE. However, it is not certain if the teachers of science use the methods which enhance this. This study looks at the methods and teaching approaches the teachers used.

According to Heimlich (1993), the interconnected nature of environmental problems, and the interactions between social and individual decision making on the development of solutions for environmental problems require that a coherent course include the social, economic, organizational and ethical dimensions and how to deal with them. Thus, an active based approach to learning is imperative if course material is to enable learners to be capable participants in environmental conservation, restoration and any other decision making at the individual and social levels.

It is important that learners are encouraged to participate in making decisions more especially on the environment. However, it is not sure whether teachers' methods of teaching the science syllabus and EE in particular encourages this. This view is supported by Novak et al (1984), when they asserted that the simple yet powerful tool of concept maps provides an example of providing the student with a method to map the concepts and connections. Again, this representation provided the student with a way to express and explore the frameworks to be learnt in the course. Thus this study attempted to find out if teachers' methods encourage this.

Gentner (1983), on the issue of "Learning to Learn" observed that the students' education needs to evolve and continue to serve them in the face of change. For this, the course should also teach the "scientific and humanistic ways of thinking," including methods of structuring a new problem, and methods of recognizing commonalties and differences in classes of problems so that the transfer of learning to a new problem occurs as it develops. Gentner has shown that such translation of learning does not occur automatically. Therefore, it is necessary that generalizability and limitations be discussed explicitly in the course.

Learners need to be trained in problem identification and taken through the relevant steps of solving them. However, it is not clear if teachers of the primary science syllabus used such methods. Hence this study was set to find out if the teachers used methods which encouraged learners to solve problems through the logical steps.

According to Abid 2003, another way of quality teaching in environmental education is introduced through ensuring quality learning experiences to the learners. Learners should view the experience of designing and implementing the conservation project in schools as one of the most contextually relevant experiences. They should recognize that field visits to community groups are meant to understand the environment and community relationship, which help them to understand complex interaction of environment with community. During the field visit, they should also explore the nature in ecosystem through partnership with organization/bodies involved in promoting EE. These are some of the unique experiences which have resulted in the learners' understanding of the environmental education with the perspective of teacher educators and environmentally literate citizen.

Teaching of environmental education for quality education requires innovation in teaching and partnership with learners. It also requires continuous reflection and redefinition of partnership between learner and teachers as facilitators. The partnership between them will ensure that the design and implementation of contextually relevant environmental education experiences is achieved. These experiences should provide learners with knowledge, skills and attitude to conserve the environment at school and in the community. The learners necessitate these real life experiences for the appreciation of various relationship of environment and man. Because

of these learning experiences, learners value and appreciate the environment and explore the opportunities to take social action for conservation and restoration of environment.

Proceedings of the workshop on integration of EE in the Formal Education Sector (1996), point out that the principle for pedagogic methods for EE should include: the learners should be active; the teacher should be a guide and not a director; learning should involve as many human senses as possible; pedagogic methods should be targeted towards the HEAD and HEART; and teaching and practical sessions should help the learners to gain experience in environmental conservation activities that are practicable in the home setting.

In the same workshop, it was indicated that the foundation of the pedagogic methods is active learning constituting of the three elements; reflection, dialogue and encounter. However, the approaches commonly used in environmental education in the formal sector are the interdisciplinary single subject mode and the multi-disciplinary infused model (Muthoka et al, 1996). Rego (1996) indicated that in Kenya, primary and secondary schools and the Primary Teachers' Colleges use the multi-disciplinary model, whereby EE components including concepts, values and skills are infused into relevant disciplines. This approach should provide useful and required opportunities for teaching EE in an integrate manner. However, it was not clear which model of integration has been in integrating EE into the primary school science of Uganda.

2.5 Challenges and Limitations Teachers faced in Integrating Environment Education

This literature pointed out the immediate challenges and limitations teachers face as ranging from issue clarification, concept of EE, limited level of training, selection of suitable methods, availability of suitable materials, motivation, attitudes and teacher motivation. Therefore, challenges of integrating EE into the primary school science syllabus can be multiple, ranging from introducing EE material into the science curriculum, to attempting to change the teachers' and the students' attitudes towards EE issues and concepts.

According to Oonyu (2003), the major hindrances teachers have faced in integrating EE is the conceptual constraints, inability to integrate EE into curricula logically and the poor training

constraints. These appear to be originating from their shaky training from colleges, general lack of interest and poor attitude towards wishing to seek information.
Mocker and Spear (1982) observe that many motivations and constraints influence teachers' enrichment choices. Teachers make enrichment selections within a complex framework that includes their personal background and training, the culture and budget of their school, the variety of students in their classroom from year to year, and a kaleidoscope of curriculum adoptions, social programs and educational trends.

Rose Hulman Institute of Technology & Carnegie Mellon University (2003), found several common drawbacks in the available material from the point of view of a course designed to promote the environmental literacy of a diverse student population. Most of the books tend to have qualitative discussions of the data presented rather than appropriate quantitative analysis where possible. Most have only a sketchy treatment (if there is any at all) of some of the central concerns for EE such as relevant details of risk, economics, and the behavioural and regulatory elements. Most of the texts lack a systems perspective, which is key to an integrated approach to EE. Discussions of science principles such as materials and energy balances are at best qualitative and lacking in detail in most of the general textbooks.

This is particularly problematic since most environmental problems (and solutions) are based on a few similar principles. Many of the environmental paradigms, such as pollution prevention and design for the environment are not treated at all. While societal values are treated in some way in each of the different books, there is no attempt to introduce a coherent framework to incorporate the value and ethical dimensions into EE. Most of the materials are designed for passive learning of facts by students rather than to develop and exercise critical thinking and decision-making skills. The skills are a crucial requirement to prepare individuals for active participation in environmental conservation and restoration programs.

On "Confidence, Ownership and Autonomy," Cassidy (1977), observed that to be competent, decision-makers/learners have to develop a problem-solving mentality that can enable them feel confident and take "ownership" of adapting solutions to new problems [In this context the researcher thinks this should be "adapting practical solutions to new problems"]. This means

that the pedagogy of teaching has to place the students in situations not only of solving a specified problem, but in situations where they have to define the problem, collect data from disuse, "real-world" situations and formulate strategy for solutions. Active problem-based learning through case studies can be used routinely in courses as a means of formulating, structuring and solving problems. These require students to represent the points of view of diverse stakeholders in the issue at hand. They also have to develop and present solutions founded on substantive knowledge and evidence. Over the years, it has been observed that a byproduct of this approach is the confidence and ownership that students develop towards their knowledge. They begin to gain the competence to go in search of the facts, analyze, synthesize and evaluate data and examine the ethics of various decisions. During the academic period, the students become increasingly autonomous and sensitive in their decision-making/learning. From the above observation, the researcher also thought this makes the students take responsibility of caring for the environment.

In support of Cassidy (1977), Abid (2006), observed that constructivism pedagogical discourse, along with the teacher, also places the learner in the attention. He argues that the central premise of learning involves construction of ideas by the learner rather than transmission of ideas to the learner. The learning experiences in a course should provide learners the opportunity to construct their own knowledge in purposeful and interesting ways. Reflection on teaching and learning provides a focus for analyzing and developing learning and teaching.

The Community Resources for Science (2003), observed that the goal of school day environmental education programs is to engage students in active learning in and about their environment. However, without understanding and buy-in from classroom teachers, this target audience will not be reached. This is particularly true in reaching the large local population of underserved kids: kids from mainly urban surroundings, kids whose families may not have access to a range of outdoor experiences, kids whose teachers work within administrative structures that are deeply determined by standardized tests and mandated curriculum reforms.

The Community Resources for Science (2003), further adds that although environmental education can be attractive to teachers in many ways, most elementary teachers do not make an

established practice of incorporating it into their teaching plans and practices. Elementary classroom teachers have a wide variety of needs and situations. They are the decision-makers in crafting lessons and learning approaches that will meet the needs of each particular class. They must weave together adopted curriculum material, best teaching practices and diverse learning experiences to help their students acquire developmentally appropriate and required skills and knowledge. Getting a picture of these situations and needs is an important step for understanding how environmental education program can provide more effective support and become a fully integrated element of a teacher's plan for classroom instruction.

Bunoti, Sarah Nantono, (2002) assert that despite the fact that both tutors and students are aware of contemporary environmental issues, they have a low awareness of environmental conservation practices. This could be because the majority of the tutors have not had any training in Environmental Education. Asimo, Harriet J. Okuni (2007), offered a solution to this by recommending a mechanism to be put in place to improve the integration of EE, for instance through providing in-service courses/further training and making the curriculum more relevant.

The Community Resources for Science (2003), groups the challenges into Curriculum Generalists, Pedagogy Challenges, Time Challenges, Science Teaching Issues, Materials, Class time, Money, Field Trip Barriers, and Teacher Motivators for Integrating Environmental Education Specific Content & Skill Development.

In reference to Uganda, Ssekandi (1996) and Oonyu (1996), both indicated the lack of trained personnel to support EE programmes at the academic levels. Oonyu (1996), emphasized that qualified personnel, though available, were not trained in EE purse, and even those who had come forward to promote EE were inadequately trained. In Tanzania, a similar problem was experienced as postulated by Shuma (1996), that there was lack of enough opportunities for in-service training of teachers in EE.

United Nations Environment Programme (1983), had earlier indicated in relation to the EE that the general aims and objectives of the primary teacher training colleges syllabus did not give much consideration to the environmental issues and approaches. EE was merely implied and

only in the list of course units under the science syllabus. It was further indicated that the primary school syllabus was much more integrated and oriented to the environment than the teachers' syllabus. This implies that teachers were not enlightened and sensitized, yet the interpretation of the syllabus is left to the individual teacher such that environment issues that may be highlighted depend on the teachers' own knowledge and sensitization from the college the teacher attended.

In light of what Said et al, (2003) noted about teachers in relation to integration of EE in formal education, teachers' training was a barrier to EE in Uganda: that teachers' attitudes, knowledge and behaviour towards the environment affected and influenced the pupils' attitudes. Likewise, the teachers' concept of EE had influence on the pupils' concept of environment education. There was a need to approve or disapprove and ascertain these claims. Therefore this research was set to find out teachers' concept of EE and how it influenced the learners' concept of EE.

Cormack (1997), pointed out the problem of lack of resources. Many schools lack physical resources and shortage of funding, basic teaching and learning resources and facilities such as textbooks, to teach effectively. Shuma (1996), also indicated a similar problem in Tanzania, where there was shortage of suitable teaching resources.

Conclusively, the literature review here shows that the origin and development of EE is rooted in traditional institutions and in international perspectives. Objectives, principles and guidelines are needed to integrate EE in the curriculum. Multiplicity of pedagogical methods could be used in EE. However, integration of EE in the schools' system faced problems and barriers. This concise literature review may not be adequate to shade light on the integration of EE in the integrated primary science curriculum in Uganda, given the wide scope of the subject. Nevertheless, it has helped to cause knowledge gaps about the situations surrounding the implementation of integrating EE in the primary science curriculum in Ugandan schools. We needed to know the primary teachers' understanding of and the conception they have had of environment issues; what methods the primary schools used when handling primary science syllabus, particularly EE aspects; and what specific challenges and constraints they faced in implementing the primary science syllabus, with specific focus on the aspects of EE.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter presented the procedure of data collection, analysis and presentation. It was based on the following aspects: the research design, area and population of study, sample size and selection, data collection instruments, testing of validity and reliability, procedure and data analysis.

3.1 Research Design

The study adopted descriptive cross-sectional survey design of exploratory nature. The research problem and the nature of the research questions involved the assessment of the perception and methods of integrating EE into the primary science syllabus and how these influenced pupils' development of environmental literacy and their participation in conservation activities. It, therefore, sought information from a sample of curriculum developers, teachers, NEMA and ESA officials and inspectors of schools all of whom had different backgrounds, training, age and experiences. This was why the survey design was seen as more desirable. A cross-sectional survey design was used because the information required from the sample target population was diverse in many aspects and the researcher did not find it possible to capture all such information at the same time. Data from the survey was collected mainly by questionnaire and interviews from a cross-section of respondents in one point at a time, data describing feelings, perceptions, views of these respondents about the research phenomenons were gathered. Both the quantitative approach such as percentages frequencies and qualitative approach were adopted to present the data.

3.2 Population of study

This study was conducted in 15 government aided primary schools of West Budama County and Tororo Municipality in Tororo district. It was on a total population of 260 respondents. Five schools from the municipality and ten schools from the rural were involved in the study. They were selected because they taught the Science Syllabus for Primary Schools and were accessible to the researcher. Curriculum developers were selected because they were involved

in developing Science Syllabus that was launched in 2000. The Science teachers of each of the schools were selected because they were the ones who taught the EE aspects within the science syllabus. They were considered to have fair knowledge of the objectives and contents of the syllabus because they were the implementers of the syllabus; Headteachers of the participating schools because they were the immediate supervisors who provided support to the teachers and managed curriculum implementation in their schools: Inspectors of the schools of the location of the research because they gave support, supervision to the teachers who implement the science syllabus with EE aspects; NEMA officials, these too offered technical support to schools on matters related to EE. Ministry of Education and Sports (MoE&S) officials because they supervise school programs and provide the necessary aids, make and oversee school policy implementations. Primary six and seven learners because they are the final beneficiaries of the school curriculum. Equal number of boys and girls were involved in each school for focus group discussion to avoid gender bias.

3.3 Sampling techniques

A simple random sampling was used to select the following five of ten urban and the ten of forty rural primary schools for the survey. The urban schools were Ogut Primary School, St. Kizito Primary Schools, Rock View Primary School, Agururu Primary School and Elgon View Primary School, Tororo. Rural schools were: Achilet Primary School, Kisoko Boys Primary School, Petta Primary School, Paya Primary School, Barinyanga Primary School, Sesera Girls Primary School, Rubongi Primary School, Mulanda Primary School, Abweli Primary School, Pajwenda Primary School. A total of fifteen schools were used out fifty government aided schools which were registered under the area of study in the district education office.

A sample size of 260 respondents was picked basing on a table of sample size is shown in table 1 below:

Table 1: Sample Size by Category

Category	Population	Sample Size
Curriculum Developers	12	3
NEMA officials (including, the District Environment Officers)	09	3
Inspectors of Schools (for Municipal and District)	08	2
Education Standard Agency (former) (especially those in primary section)	08	3
Head teachers	50	15
Science Teachers of P.6 & P.7 classes	219	57
Primary six and seven pupils	723	180
TOTALS	**1027**	**263**

However, the pupils in the selected schools were sampled using Stratified Proportionate Sampling. This was to cater for the different characteristics like class level and gender. The researcher used P.6 and P.7 because these classes used English as the medium of instruction both in municipality and rural schools and the pupils were able to express themselves in English. In addition, pupils of these classes were old enough to participate more meaningfully in various conservation activities. In these classes, pupils were able to understand EE issues, had clearer attitudes towards their environment, which helped to sharpen their skills to participate in corrective actions.

3.4 Instruments for Data Collection

Questionnaire

A semi-structured, self-administering questionnaire was used for collecting data from Curriculum Developers, NEMA Officials, head teachers and Science teachers of the 15 participating schools. Each set of questionnaire had five sections. Section A sought information on personal data of the various respondents. Section B sought information on Integration of EE in the Integrated Science Syllabus. Section C sought information on the teachers' perception of EE. Section D sought information on the methods teachers use in teaching science, especially the EE aspects. Section E sought information related to the challenges and limitations in teaching science and integrating EE aspects. Questionnaires were used to ensure confidentiality of respondents saved time especially that respondents were busy

teaching since it was school time. It did not require close supervision. There was an interview guide to enable the researcher collect further information from 15 headteachers and 57 science teachers. The interview guide gathered information on the areas of science contents in which EE aspects have been integrated; information related to the teachers' understanding and perception of EE and information on the methods teachers used when teaching EE aspects in primary schools, challenges and limitation they encountered in integrating EE during science lessons. The information gathered by this means was useful in cross-checking what was obtained through the questionnaires.

Lesson Observational Guide

The researcher conducted a lesson observation using a guide which was filled in by the researcher to establish how each of 12 teachers observed conducted science lesson. The observation focused on the methods the teachers used, notes given to learners' activities learners engaged during the lesson, the kind of questions and answers which accrued from the lessons. Focus was on the lesson introduction, main body, the conclusion and assignment for learners in each lesson observed.

Focus Group Discussion Guide

The researcher used focus group discussion guide to gather information from a total of 180 pupils. The focus group discussion guide sought information on the learners' perception of EE, level of knowledge skills and values they held. It also gathered information on conservation activities the learners were involved in either within school or back at their homes. It further collected information related to methods teachers used when teaching. The methods of learning, the pupils preferred to be used by their teachers when they teach EE aspects of science were also captured.

3.5 Validity and Reliability of Instruments

(a) Validity

Validity is the extent to which the measurement technique used actually measures the attribute or behaviour it is intended in the study. The content validity of the instruments was tested by giving the constructed instruments to the supervisor, fellow students and other research experts

for constructive criticism. The Content Validity Index (CVI) was used later to ascertain further validity of the instruments. The formula used was:

$$\text{CVI} = \frac{\text{Sum of the agreements on every relevant judgment}}{\text{total number of items}} \times 100$$

Since the content validity percentage was above 50, the instruments were said to be valid. This was obtained because the agreement on valid items exceeded those that were taken to be invalid.

(b) Reliability

Reliability refers to the level of dependability of items in the research instruments. The items were tested on consistence and steady fastness in the answers they derived from various respondents got from the pilot schools which were used and were not selected for the actual study. The reliability of the instruments was established using Cronbach's method with the following formula:

$$\textit{Error correction} = \frac{\textit{Effective size}}{\textit{square root of r}}$$

where r is the reliability coefficient of dependent variable

All instruments were field tried and tested for validity and reliability before being used. This was to ascertain ability to capture the information they are meant for and check on how respondents reacted to them. After the instruments had been piloted, the results were used to improve upon their quality. The supervisor and other advisers read through and helped to make final comments and other necessary adjustments. This helped to improve the content validity of the instruments. The final instruments were then presented to the researcher's supervisor and head of Department of Science and Technical Education (DOSATE) for final vetting. Each was requested to give content validity index of the instruments and any other comments for improvement. The average CVI was worked out to get the final content validity index. Upon a high level of CVI and favourable comments from vetters, the researcher proceeded to use the instruments to collect data.

3.6 Procedure for Data Collection

The researcher constructed instruments for data collection, obtained a letter of introduction from the Head, Department of Science and Technical Education, (DOSATE), Makerere University, which introduced him to the relevant authorities in the district and schools to collect data. After obtaining a letter of introduction from the School of Education, the researcher proceeded to Tororo to gather data himself, using these instruments. The researcher reached and personally distributed questionnaires to the other part of the sample that did not live in Tororo individually, waited for the questionnaires to be completed and collected each of them the same day. Document analysis was used to determine area of the old science syllabus where integration of EE had been done.

Data collection in schools was proceeded by a workshop for head teachers and one science teacher from each participating school. This workshop helped to make arrangements that enabled the researcher to easily cover the research activities in the schools and also enabled the researcher to distribute questionnaires to head teachers and teachers at the same time.

Lesson observations was carried in the participating classes. A lesson observation guide was used to take note of the progress of each lesson by filling in information into the chart. The information gathered was compiled and processed.

Focus group discussions were conducted on agreed dates to randomly selected P.6 and P.7 pupils, whereby there was equal representation of boys and girls to avoid gender bias. Information gathered from each focus group discussion was written down, compiled and processed.

3.7 Data Analysis

Data collected from the various questionnaires was scored. Each respondent score was converted into percentage to help determine the range perception and integration of environmental issues through the Integrated Science Syllabus.

The pupils' perception was rated as low, moderate and high. Similarly, the pupils' participation in conservation activities was scored and rated low, moderate and high. The rating was determined by the range of scores from the low scores to the high scores, and by obtaining the middle score between the two. Low perception and participation were then obtained by subtracting the same value between the high score and middle score from the latter. These were then analyzed using Chi-Square, which is a test of relationship. Because the researcher was analyzing low and high perception, the following formula was applied to analyze the data.

$$X^2 = \frac{(O - E)^2}{E}$$

Information obtained from interviews and lesson observations was analyzed by a descriptive method and was used to augment whatever information that was obtained from questionnaire.

The four research questions required both qualitative and quantitative data. The qualitative and quantitative data analysis were used. The statistical package for social sciences (SPSS) was used. The information to the research question one was analyzed by looking at the documentary information available on the primary science syllabus and support materials. Research questions two and three generated both qualitative and quantitative data. However to bring the relationship between perception and methods used by teachers, chi-square statistical analysis was used. For research question four, it is descriptive data and therefore the information has been summarized from the respondents comments.

CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the results of the study in relation to the objectives and research questions, which are presented in form of tables showing frequencies and percentages. It is divided into five sections. The first section presents findings on the respondents' background. The second section presents findings on the extent of integration of EE topics in the primary science syllabus; findings on teachers' perception of EE are presented in the third section. The fourth section has findings on methods being used by science teachers when teaching the EE aspects of the primary science syllabus while the fifth section presents findings on the challenges and limitations encountered by teachers of primary science in the teaching of EE.

4.2 Background information

The respondents' background information included sex, level of education, professional qualification, designation of office, geographical coverage in terms of work, involvement in the development of curriculum, and in case of teachers, the period spent teaching integrated science, and the classes in which integrated science had been taught. The findings on the respondents' background are presented in Table 2 below.

Table 2: A Summary of background information of respondents

Variables	Labels	Frequency	Percentage
Sex	Male	37	63
	Female	22	37
Level of Education	Secondary	59	100
	Tertiary	59	100
	University	17	29
Professional qualification	Teacher	57	97
	Environmental management	2	3
Designation of ESA and NEMA officials	Assistant Chief Inspector	1	12.5
	Senior Inspector of Schools	3	37.5
	Environmental Educational Coordinator	1	12.5
	Director District Support	1	12.5
	Coordination & Public Education	1	12.5
	District Environmental Officer EE Coordinator	1	12.5
Tenure of ESA and NEMA Officials	1-2 years	2	10
	3-5 years	5	25
	Over 5 years	13	65
Geographical coverage in terms of work for ESA and NEMA officials	District	3	37.5
	National	5	62.5
Period spent doing curriculum work as curriculum developer	3-5 years	1	33.3
	Above 5 years	2	66.7
Involved in the development of 2000 science curriculum involved in Teaching Integrated Science	No	0	0
	Yes	3	100
	Less than a year	3	8.3
	1-2 years	6	16.7
	3-4 year s	12	33.3
	5 years	36	41.7

According to the results in Table 2, the majority of the respondents (63%) were males and the rest (37%) females. This distribution is not surprising because according to Muhwezi (2003) the proportion of males to female is higher in upper primary classes. Thus, the findings show that the sample was representative of the population in terms of gender. Findings further show that all respondents to questionnaires (100%) had attained secondary and tertiary levels of education. The implication of this to the study is that most of the respondents were in position to understand what was asked in the questionnaires, which were in English and were self-administered. Thus, information given can be relied upon. Most of the respondents, 97%, were teachers. This population, the study targeted, was mainly composed of teachers who are expected to know, understand and implement the primary science syllabus.

The sample shows 75% of teachers have taught Integrated Science for 3 or more years. This experience helps them to have better insight into EE integration in the syllabus. The sample was representative of the population in terms of professional qualification. There were more inspectors among the category of Inspectors of Schools, NEMA Officials and members of Education Standards Agency (ESA) because inspectors were at district headquarters, at municipal council and at the country level. The table also shows a variety of designations at the categories of ESA and NEMA officials involved in work relevant to integration of EE in the primary school science curriculum. The implication is that various views concerning the integration of EE in primary school science curriculum were sought from a sample that is in position to provide reliable information.

Regarding tenure, findings showed that most respondents in the category of ESA and NEMA (65%) had worked in their respective positions for over 5 years. With this experience, they were more acquainted with the integration of EE in the primary school science syllabus. Regarding the Inspectors of Schools, NEMA and ESA officials, most of their geographical coverage in terms of work was national. This gave them a national perspective and a more suitable opportunity to have accurate knowledge about the integration of EE in the primary school science syllabus.

The national experience is also useful in gauging the teachers' ability and methods of integrating EE in the curriculum nationwide. Findings show that most Curriculum Developers (66.7%) had spent more than five years doing curriculum work and all (100%) were involved in the development of integrated science curriculum. It also puts them in a better position to understand more about the integration of EE in the primary school science curriculum. As for the teachers, findings show that most, (41.7%), had spent over 5 years teaching Integrated Science, which also puts them in a position to understand more about the integration of EE in the primary school science curriculum and its associated constraints.

4.3 Extent of integration of EE topics in science syllabus

Analytical study of science syllabus and relevant learning materials

An analytical study of Primary Science Syllabus in the Uganda Primary Curriculum Volume one was done and summary made in table 3. It shows the themes relevant to EE and at which classes in primary schools they are taught. The Syllabus aims which the researcher considered relevant in EE promotion have also been reflected.

Table 3: Themes and EE related aims in the Integrated Science Syllabus

Themes	Classes where taught	Syllabus aims and objectives relevant for EE
1. The Environment	All classes P.1 – 7	To develop in the pupils' life skills and the ability to use problem solving approaches in various life situations, particularly of a scientific and technological nature.
2. Human Health	All classes P.1 – 7	To enable the pupils understand and develop the capacity to improve and maintain their own health, that of the family and the community.
3. The World of living things	Only in P.1 – P.4 and 6	To enable the pupils acquire a variety of practical skills of living in a world of multi-skilled work.
4. Human Body	Only in P.1, P.5 and 7	To develop in the pupils the appropriate attitude towards science that will promote cooperation, honesty, responsibility, respect and care for others in the community.
5. Matter and Energy	Only in P.2, 4-7	
6. Managing changes in the environment	All classes except P.6	To promote pupils' understanding of the importance of the protection and sustainable utilization of natural environment for improved quality of life.
7. Science in Human activities and occupations	Only P.2, 3, 5 and 6	To enable the pupils to understand and develop the capacity to improve and maintain their own health, that of the family and the community.
8. Community population and family life	In all classes except P.6	To promote scientific communication skills necessary for taking informed decisions on issues relating to health and environment.

Source: Uganda Primary School Curriculum Volume One

The analysis of the syllabus showed that: The environment and human health themes are taught in each of the primary school classes. Managing changes and community population family life themes were taught in all classes, except P.6. The World of Living things was taught in all class, except P.5 and P.7. Matter and energy was taught in all classes, except P.1 and P.6. This theme does not have a directly relevant EE aims and objectives in the science syllabus. However, themes, Science in Human Activities and Occupation are not taught in P.1, 4 and 7 and Community – Population and Family Life is missed in P.2, 4 and 6. Thus, the themes in order of their popularity are 1, 2, 4, 5, 6, 3, 7 and 8, have aspects of EE. This showed that EE aspects are in all themes and therefore taught at all classes.

As shown in table 3 above, there are three aims in the science syllabus that are directly relevant to and address environment. However, the others have some implications to environment issues and in a way may influence the shaping of learners' attitude towards environment and conservation practices.

The existing pupils' textbooks, the syllabus and Teachers' Guide all cover the above themes in sufficient detail. However, there was no standard course book for Integrated Science in Primary Schools in Uganda. It was noted that different titles of school science textbooks recently distributed to government aided schools had varying details on EE.

However, it was also noted that there were no specific guides to help teachers on how to integrate environmental issues neither in science nor the other subjects. There were some EE materials in schools that are supplied by NEMA on whole school program.

Responses on integration of EE in science curriculum by categories of respondents

A number of questions relating to existence of EE aspects in primary science syllabus and pupils' learning were presented to the different categories of respondents. Findings on these questions are presented in Tables 4 and 5. Findings on the existence of integration of EE in Science Syllabus is presented in Table 4.

Table 4: Existence of integration of EE in science syllabus

Category	Total No. of Respondents	Responses		Total
		Yes	No	
Curriculum Developers	3	3 100%	0 0%	3 100%
Headteachers	15	15 100%	0 0%	15 100%
Teachers	57	56 98.2	1 1.8%	57 100%
ESA & NEMA Officials	8	7 87.5%	1 12.5%	8 100%

In response to whether there is any EE content integrated in the science syllabus, all curriculum developers and headteachers said yes. Over 90% of teachers said there was and over 85% of the officials of ESA and NEMA indicated yes.

When asked in an oral interview, all categories of respondents were able to give examples of topics of EE found in the science curriculum. Examples of topics given include: Sanitation; water cycle; crop husbandry; our environment; environmental degradation; energy resources in the environment; home and community health and weather. The teachers in their list of examples included waste management; Human health and interdependence of living things. The responses from the different categories concur with the findings of the analytical study of the science syllabus. There is EE content integrated into the primary science syllabus.

During the focus group discussions with pupils at different schools, they were able to reveal that teachers cover with them EE related topics. The pupils were able to give examples of topics they have learnt which are environment related. These topics included: plants and animals, sanitation, soil erosion, wetlands and weather.

Findings on the existence of integration of EE in science learning materials. The findings from different categories on the existence of EE content in pupils' science learning materials is presented in table 5 below:

Table 5: Existence of integration of EE in pupils' science learning materials

Categories	Total No. of Respondents	Responses		Totals
		Yes	No	
Curriculum Developer	3	3 100%	0 0%	100%
Headteachers	15	13 83.3%	2 16.7%	15 100%
Teachers	57	56 98.2%	1 1.8%	100%
ESA & NEMA Officials	8	5 62.5%	3 37.5%	8 100%

All curriculum developers indicated the existence of EE content in the pupils' science learning materials. Over 80% of headteachers, 98% of teachers and 62% of the ESA and NEMA officials indicated there is EE in the pupils' science learning materials. These findings were further confirmed during the oral interviews with the different categories. Different categories of respondents were able to give examples of topics found in pupils' learning materials. The examples of topics they gave were similar and included: managing changes in the environmental components of the environment; interdependence of living things; water cycle; conservation of the environment; diseases and disease vectors; controlling and managing changes in the environment; human health and the weather.

This view was further confirmed by pupils during the focus group discussions. Pupils indicated that there are EE topics in the textbooks they read. Pupils gave examples of topics they read in their books. These include: cleanliness in school compound; cleaning water source; farming methods; control of disease vectors plants and animal life and the ways of controlling vectors.

Mode of integration of EE into science curriculum

The mode of integration of EE in the Science Curriculum considered were content, values, skills and conservation practices. Responses of different stakeholders on mode of integration in Science Curriculum is presented in table 6 below.

Table 6: Mode of EE integration of aspects in science curriculum

Mode of integration	**Headteachers**		**Curriculum Developers**		**Teachers**		**Inspectors**		**Total**	**%**
	Freq.	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**83**	**100**
Contents	3	20	3	100	57	100	8	100	71	85.5
Values	2	13.3	1	33.3	26	45.6	2	25	31	37.3
Skills	1	6.7	2	66.7	1	1.8	1	12.5	5	60
Conservation Practices	3	20	5	66.7	0	0	3	37.5	8	96

From the findings above, 85.5% of the respondents say there is content integration of EE in the Science Curriculum while only 37.3% think values have been integrated only 6% feel skills have been integrated, 9.6% indicated conservation practices of EE had been integrated in the Science Curriculum and 20% of the headteachers thought that there was content integration of EE in the science syllabus and about the same number thought that there was conservation practices included in the syllabus. However, all respondents of the other categories affirmed the integration of EE in the science syllabus. This showed that content integration of EE has been done as given in the science syllabus but guidance into development of values, skills and practices was inadequately done. This is shown by low % of responses from the different categories of respondents.

Rating of integrating EE in the science syllabus

The different categories of respondents were asked to rate the integration of EE in the science syllabus. The findings were presented in table 7 below.

Table 7: Rating of the integration of EE aspects into the science curriculum by different categories of respondents

Rating	Headteachers (15)		Teachers (57)		Inspectors, (ESA, NEMA) (8)		Curriculum Developer (3)		Overall Total (83)	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Total	%
Very satisfactory	0	0	19	33.3	0	0	0	0	19	22.9
Satisfactory	10	66.7	36	63.1	7	87.5	3	100	56	67.5
Not sure	--	--	--	--	--	--	--	--	--	--
Unsatisfactory	0	0	2	3.7	1	12.5	0	0	3	3.6
Very unsatisfactory	0	0	0	0	0	0	0	0	0	0

From this rating:

No headteacher, ESA, NEMA official or curriculum developer was very satisfied with the integration of EE into the science syllabus except some (33.3%) teachers. No respondent indicated not being sure of integration of EE into the Science Curriculum. No respondent indicated that integration of EE is very unsatisfactory.

Generally all categories of respondents were satisfied with the EE integration in the syllabus. 67.5% of the respondents rated EE integration as satisfactory. Whereas 3.6% rated the integration of EE into science syllabus as unsatisfactory, only 19 teachers (22.9% of the overall) rated the integration of EE into the syllabus as very satisfactory.

The findings indicated that the majority of the headteachers (66.7%) reported being satisfied with the integration of EE in primary science syllabus. The majority of the Teachers (63.1%) reported being satisfied with the integration of EE in primary school while 33.3% were very satisfied and remaining few (3.7%) were unsatisfied with the whole process of integration. Thus, these findings concur with most headteachers who were satisfied with the integration of EE in primary school.

In addition, the Inspectors, ESA and NEMA officials were also asked to rate the integration of EE and 87.5% were satisfied with EE integration in the science syllabus. Thus, the findings from this category are in tandem with most headteachers and teachers who were satisfied with the integration of EE in primary school science syllabus.

Curriculum developers were also asked to rate the integration of EE. As seen in table 7 above, it is indicated that all curriculum developers (100%) reported being satisfied with the integration of EE in the primary school science syllabus. Although this agrees with what most headteachers, teachers and Inspectors, ESA and NEMA officials indicated, the high % could also be showing curriculum developers could be defending the work in producing science syllabus.

Further opinion on the integration of EE in science syllabus

Questions were asked seeking further opinion of different categories on integration of EE in science syllabus. The findings were recorded in table 8 below.

Table 8: Further opinion of different stakeholders on EE integration into science syllabus

	Categories									
Aspects	**Headheadteachers (15)**		**Teachers (57)**		**Inspectors ESA & NEMA (8)**		**Current Developers (3)**		**Overall Total (83)**	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Primary Science Syllabus covers broadly EE issues and concepts	10 66.7%	3 33.3%%	47 73%	10 27%	5 62.5%	3 37.5%	3 100%	0 0%	65 78.3%	18 21.7%
The various EE issues and concepts are clearly brought out in science syllabus	12 80%	3 20%	56 97.3%	1 2.7%	3 37.5%	5 62.5%	2 67%	1 33%	73 88.2%	10 12%
There is need for further improvement in the integration of EE concepts and issues in the Primary Science Syllabus	15 100%	0 0%	51 89.4%	6 10.6%	6 75%	2 25%	2 67%	1 33%	71 89.1%	9 10.8%

From the findings, over 78% of all the respondents indicated that the primary science syllabus covers broadly EE issues and concepts and 88.2% of them indicated that the EE issues and concepts are clearly brought out in the science syllabus. However, over 89% indicated that

further integration of EE concepts and issues could still be improved in the science syllabus. Thus, from the above results, there is indication that there exists EE to a satisfactory level in the primary science syllabus and pupils' reading materials. However, more integration of values, skills and practices could still be done.

4.4 Teachers' perception of EE

The perceptions of different categories about EE was first sought. This in turn provided a basis upon which they could judge the teachers' perception of EE and its integration into the Science Curriculum.

Respondents' perception of the concept of EE

A number of questions were asked to find out the different perceptions of the different respondents on the concept of EE. It was found imperative to establish the perceptions of the respondents before they could assess the perceptions of teachers. From the findings as seen in Table 9, it is evident that they understood the EE concept.

Table 9: Perception of the respondents on the concept of EE

Attributes of EE	Headteachers (15)			Teachers (57)			Curriculum Developers (3)			Inspectors, NEMA & ESA (8) Officials		
	Ag	Da	Un	Ag	Da	Un	Ag	Da	Un	Ag	Da	Un
1. EE deals with the process of passing on knowledge and understanding and its conservation practices to learners.	(11) 91.7%	(0) 0%	(1) 8.3%	(50) 88%	(3) 5%	(4) 7%	(2) 67%	(1) 33%	(0) 0%	(6) 75%	(2) 25%	(0) 0%
2. EE is concerned with the preparation of learners' participation in conservation activities.	(10) 83%	(10) 0%	(2) 16.6%	(26) 45.5%	(10) 18%	(21) 36%	(3) 100%	(0) 0%	(0) 0%	(7) 88%	(1) 12%	(0) 0%
3. EE should help increase participation in conservation activities.	(11) 91.7%	(0) 0%	(1) 8.3%	(31) 62%	(8) 14%	(18) 14%	(3) 100%	(0) 0%	(0) 0%	(8) 100%	(0) 0%	(0) 0%
4. The central problem of teaching EE practically is time wasting and requires many other resources.	(4) 33.3%	(0) 0%	(8) 64%	(50) 88%	(1) 2%	(6) 10%	(1) 33%	(2) 67%	(0) 0%	(3) 43%	(4) 50%	(1) 7%

Key: Ag - Agree
Da - Disagree
Un - Undecided

There's a high percentage (91%) of headteachers who agreed to the statements that EE deals with the process of passing on knowledge and understanding its conservation practices to learners. However, only 33.3% of headteachers agree with the statement that the central problem of teaching EE practically is time wasting and requires many other resources. There is equally a high percentage of teachers who agree to the statements about EE, except for a low percentage (45.5%) of teachers who agree that EE is concerned with the preparation of learners to become environmentally literate people. Similarly, there are high percentages among the categories of Curriculum Developers and Inspectors, ESA and NEMA officials on each statement on EE.

There is a reasonable percentage of teachers who are undecided about each statement about EE. Among Inspectors, ESA and NEMA officials category, there were about 50% who disagree with the statement that the central problem of teaching EE practically was time wasting and requires many other resources. However, 88% of the teachers agree with the same state.

Although there was not a uniform percentage agreement to each state by each category, findings tended to point to the fact that each category has a fairly good perception of EE. All categories indicated their agreement to the fundamental attributes of EE. Therefore, they could give satisfactory opinion of the teachers' perception of EE in the primary school science curriculum.

Teachers' perception of EE and their effectiveness in delivery

All categories of the respondents were asked to give their opinion of the teachers' perception of EE and whether or not the teachers made pupils effectively understand environmental issues and concepts as would be expected as result of their clear perception of EE. Their opinions were captured and presented in table 10 below.

Table 10: Opinion whether or not teachers have an understanding of the concept of EE

Categories	Responses		Total
	Yes	No	
Curriculum Developers	3 100%	0 0%	15 100%
Headteachers	14 93.3%	1 6.7%	12 100%
Teachers	37 66.6%	20 33.4%	57 100%
Inspectors, ESA & NEMA Officials	5 62.5%	3 37.5%	8 100%

All (100%) curriculum developer respondents thought that teachers had an understanding of the concept of EE and its integration in the primary science syllabus.

A higher % of (93.3%) the headteachers (who were immediate supervisors of teachers) were in the affirmative that teachers have an understanding of the concept of EE and its integration in the primary science syllabus while 6.7% of the headteachers thought that there were some teachers who did not have an understanding of the concept of EE. However, 66.6% of the teachers indicated have an understanding of EE concept and its integration in the primary science syllabus. While 33.4% of the teachers who expressed that teachers did not have an understanding of the concept of EE and therefore its integration in the science syllabus.

Over 62% of Inspectors, ESA and NEMA officials thought that teachers had an understanding of EE. Although 37.5% of this category who felt that there were some teachers who did not have an understanding of EE and consequently its integration in the primary science curriculum. Thus, this suggested that all categories had a high positive opinion about the teachers' understanding of EE and its integration into the primary science syllabus. The high percentage of the different categories of respondents indicated teachers' understanding of EE. This tended to indicate that teachers should be able to integrate EE into the science curriculum effectively.

Opinion of the respondents were also sought on whether teachers make pupils effectively understand EE issues and concepts. Their responses are recorded in table 11 below.

Table 11: Opinion on whether teachers make pupils effectively understand environmental issues and concepts.

Categories	Responses		Total
	Yes	No	
Curriculum Developer	3 100%	0 0%	3 100%
Headteachers	15 100%	0 0%	15 100%
Teachers	42 74%	15 26%	57 100%
Inspectors ESA & NEMA Officials	6 75%	2 25%	8 100%

All (100%) of both curriculum developers and headteachers had EE positive opinion about the teachers' ability to make pupils effectively understand environmental issues and concepts. 74.6% of the teachers indicated that they had the ability to make pupils effectively understand environmental issues and concepts. The opinion of the majority (75%) of the respondents in the category of the inspectors, ESA and NEMA officials was that teachers have the ability to make pupils effectively understand environmental issues and concepts. The high percentage of the different categories with positive opinion about teachers' ability to make pupils understand EE is in harmony with the high percentage that indicated that teachers understood EE. Thus this suggested that the primary teachers were able to make pupils effectively understand environmental issues and concepts.

In support of these findings, during the focus group discussions, the pupils revealed that EE was concerned with environmental degradation, plant and animal life, surrounding vegetation climate, physical features, soil as well as air. It is concerned with how people utilize the resources in the surrounding. Pupils were able to give examples of activities which included: cleaning latrines, burn rubbish, slashing the compound, slash the grass, digging in school gardens and planting trees. Most pupils reported that these activities are learnt at school but are

practiced both at school and at home. Also, during the focus group discussions, pupils stated that their teacher enabled them to understand EE issues. The evidence from respondents to the question and pupils during focus group discussion indicated that teachers made pupils understand EE issues and concept.

Rating of teachers' perception of the concept of EE.

The different categories were asked to rate the teachers' perception of EE concept. The findings are presented in table 12 below.

Table 12: Rating of teachers' perception of EE by different stakeholders

	Headteachers (15)		**Teachers (57)**		**Inspectors (NEMA, ESA) (8)**		**Curriculum Developers (3)**	
Rating	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Very satisfactory	8	53.3	15	26.3	5	62.5	0	0
Satisfactory	2	13.3	36	68.4	1	12.5	2	66.7
Not sure	0	0	0	0	1	12.5	1	33.3
Unsatisfactory	4	33.3	3	5.3	1	12.5	0	0
Very Unsatisfactory	5	0	0	0	1	12.5	0	0

The findings in Table 12 show that 53.3% of headteachers rated teachers' concept of EE as very satisfactory. This suggests that most of the headteachers are very satisfied with the teachers' concept of EE. However, the findings also show that a few headteachers (33.3%) were not satisfied with the teachers' concept of EE. The findings presented in the table also show that more than half of the teachers (68.4%) rated their concept of EE as satisfactory; Very few teachers (26.3%) rated teachers' concept of EE as very satisfactory (5.3%) as unsatisfactory and none as very unsatisfactory. This suggests that most teachers are satisfied with their concept of EE.

Generally, most of the respondents rated the teachers' perception as satisfactory or very satisfactory. This tallied with what was presented on table 10 on different categories' opinion

on the teachers' understanding of EE concepts and table 11 on opinion whether teachers were able to make pupils understand the EE concept and issues in the science syllabus. This means that the teachers' perception should enable them comfortably teach the EE aspects of the science syllabus.

Relationship between integration of EE in Primary Science Syllabus and Understanding of EE issues and concepts

Cross tabulation between integration of EE in Integrated Science Syllabus and Understanding of EE issues and concepts. The findings are presented in Table 13.

Table 13: Integration of EE in Primary Science Syllabus and Understanding of EE issues and concepts

Integration of EE in Primary Science Syllabus	**Understanding of EE issues and concepts**			**Total**
	Very Good	**Good**	**Poor**	
Very satisfactory	38 (63.3%)	11 (18.3%)		49 81.7%)
Satisfactory	7 (11.7%)	3 5%)		10 (16.7%)
Unsatisfactory			1 1.7%)	1 (1.7%)
Total	45 (75%)	14 (23.3%)	1 (1.7%)	60 (100%)
Chi-square value	$X^2_0 = 60.3$ df = 42 $X_{o=05} = 23.5$			

The findings show an association between integration of EE in the Primary Science Syllabus and understanding of EE issues and concepts. The association was significant because at df = 4, chi-square observed ($X^2_o = 62.3$) was greater than chi-square critical ($X_{o=05} = 23.5$). Thus, findings show that most respondents (63.3%) who said that integration of EE in primary science syllabus was very satisfactory also said that the understanding of EE issues and concepts was very good. The second largest proportion of respondents (18.3%) who said that integration of EE in primary science syllabus was very satisfactory also said that the understanding of EE issues and concepts was very good. The implication of these findings is

that the more satisfactory the integration of EE in primary science syllabus, the better the understanding of EE issues and concepts.

4.5 Methods primary science teachers used when teaching EE aspects in the primary science syllabus

Information on methods teachers use in teaching the EE in the primary science syllabus was sought from all categories, including the pupils who participated in Focus Group Discussions from the sampled schools. Science lessons were observed in P.6 and P.7 of the sampled schools. Due to interruptions of school activities in St. Kizito, Abwel and Pajwenda Primary Schools, it was not possible to observe lessons. The results on methods teachers used from the questionnaires, interviews and the analyses of the lesson observation results are presented in tables as follows.

Table 14: Headteachers' views on methods used in teaching EE aspect in integrated science syllabus

Pedagogical methods	**Frequency (Out of 15)**	**Percent**
Discussion and observation	12	80
Explanation	12	80
Demonstration	10	66.6
Field trip	8	53.3
Chalk and talk	6	40
Question and answer	5	33.3
Practical	3	20
Illustration	2	13.3

On methods used in teaching EE aspect in integrated science curriculum, the headteachers' findings suggest that the most common ones were discussion (80%) and explanation (80%), demonstration and field trip, in that order. The interview with headteachers confirmed the same methods used by teachers in teaching EE aspects in primary science syllabus. However, headteachers of Elgon View, Oguti, Rockview and Achilet Primary Schools in an oral interview indicated that their science teachers used observation, group discussions, excursions

during lessons. During the focus group discussions, pupils revealed that their teachers mostly explain to them EE issues. Pupils also stated that although they studied science lessons from their classroom, a few times teachers took them out of classroom to look at plants and animals around the school compound. Pupils were able to give examples of place and areas where they had ever visited when studying EE, which included under the trees in the school, school compound, garden, rubbish pits and kitchen. It was only in Rock View and Elgon View Primary Schools where pupils indicated field trips to the zoo, mountains and lakes.

When the headteachers were asked whether these were the most effective ways of teaching environmental issue in the integrated syllabus, most of them responded in affirmative, while the rest said they did not think so. When headteachers were asked why they still use the same methods for teaching EE in primary school, some responded that they are cheaper compared to those not used, while others responded that teachers are reluctant to make use of local materials in teaching EE, uncooperativeness of parents to contribute towards what would be better methods or to the purchase of EE teaching materials.

Headteachers were asked to suggest the methods they would recommend for effective teaching of environmental issue in primary schools. The findings are presented in Table 15 below.

Table 15: Headteachers' suggestion on recommended methods to be used in teaching EE

Recommended methods	**Frequency (out of 15)**	**Percent**
Discussion and Observation	14	93.3
Demonstration	12	80
Field trip	12	80
Excursion	8	53.3
Practical	4	26.7
Question and answer	3	20
Assignments	1	6.7
Lecture	1	6.7
Visits	1	6.7

Results from headteachers' suggestions as recommended methods indicate the following methods in their order discussion and observation (93.3%), demonstration and field trip (80%) and excursions (53.3%). Others include practicals, question and answer, assignment, lectures and visits. In the oral interviews with headteachers of Oguti, St. Kizito and Achilet Primary Schools confirmed similar methods were commonly used by their science teachers. They sighted practical methods as expensive and require time which is not provided for on the timetable. However, the results of methods indicated as used by teachers and listed as suggestions for recommendation by headteachers tended to be mixed up with techniques and activities in teaching.

Questions relating to the methods the integrated science teachers use when teaching EE aspects in primary schools were also presented to the teachers. The findings on these are presented in Table 16 below.

Table 16: Teachers' responses on methods used in teaching EE aspect in Primary Science Curriculum

Pedagogical methods	**Frequency (out of 57)**	**Percentage**
Discussion and observation	49	86
Explanation	42	73.7
Experimentation	33	57.9
Demonstration	32	56.1
Field trip	32	56.1
Discovery	28	49.1
Excursion	20	35.1
Chalk and talk	13	22.8
Field trip	8	14.0
Project methods	5	8.8
Question and answer	3	5.3
Drama	2	3.5
Integration	2	3.5
Lecture	2	3.5
Practical	2	3.5
Illustration	2	3.5
Story telling	2	3.5
Brain storming	1	1.8
Child to child	1	1.8
Oral question	1	1.8

On methods used in teaching EE aspect in the integrated science syllabus, teachers' findings suggest that the most commonly used were discussion and observation (86%), explanation (73.7%), experimentation (57.9%), demonstration (56.1%), field trip (56.1%), discovery and excursion. The teachers' list of methods suggested was longest among the three categories. It would appear teaching strategies and activities have been included as methods. The first seven methods suggested by teachers were similar to what the headteachers suggested.

When the teachers were asked whether these are the most effective ways of teaching environmental issue in the integrate syllabus, some observed that some methods are good while others are not. Some mentioned the advantages while others mentioned shortcomings they encounter while using these methods. Among the advantages mentioned were: encouraging active involvement of learners, making learning to be real, methods are appropriate and child centered. The shortcoming to using some of the methods were failure to carry out experimentation because of lack of instruments and learning materials, lack of apparatus, methods used were not very appropriate, EE taught in abstract, lack of science equipment for experimentation, some of the methods being costly in terms of facilities and the practical part of it not indicated in the textbook.

Teachers were also asked about the methods they recommend for effective teaching of environmental issues in primary schools. The findings are presented in Table 17 below.

Table 17: Teachers' suggestions on recommended methods to be used in teaching EE

Recommended methods	Frequency	Percentage
Discussion and observation	27	73
Experimentation	24	65
Demonstration	20	54
Field trip	18	49
Practical	12	32
Excursion	7	19
Explanation	5	14
Project methods	4	11
Integration	2	5
Question and answer	1	3
Brain storming	2	3
Advise from resourceful people	1	2
Assignments	1	2
Child to child	1	2
Drama	1	2
Lecture	1	2
Visits	1	2

On the methods that should be used in teaching EE aspect in integrated science syllabus, teachers' suggestions indicated (73%) discussion and observation. The others in their order included experimentation, demonstration, field trip, practicals excursion, explanation and project methods. Questions relating to the methods the integrated science teachers used when teaching EE aspects in primary schools were presented to the Inspectors of schools, NEMA and ESA officials. The findings on these questions are presented in Table 18 below.

Table 18: Inspectors of Schools, NEMA and ESA official's responses on methods teachers use in teaching EE aspect in integrated science syllabus

Pedagogical methods used	Frequency (out of 8)	Percent
Talk and chalk	5	62.5
Explanation	5	62.5
Demonstration	4	50
Discussion and observation	4	50
Excursion	4	50
Field trip	3	37.5
Field trip	3	37.5
Question and answer	3	37.5
Practical	2	25
Illustration	2	25

On the methods teachers used in teaching EE aspect in integrated science syllabus, Inspectors, ESA and NEMA officials indicated Talk and chalk (62.5%), Explanation (62.5%), as most commonly used methods. The other methods indicated by this category were discussion and observation, explanation, experimentation, demonstration and excursion as commonly used.

The Inspectors, ESA and NEMA officials were asked to indicate recommended methods for teaching EE in the primary science syllabus. Their responses were presented in table 19 below.

Table 19: Views of Inspectors, ESA and NEMA officials on recommended methods for teaching EE

Recommended methods	Frequency	Percent
Discussion and observation	6	75
Experimentation	6	75
Demonstration	6	75
Field trip	5	63
Excursion	5	63
Explanation	5	63
Practical	4	50
Visits	4	50

The ranking of methods recommended for teaching EE in the science syllabus as given by Inspectors, ESA and NEMA officials slightly differed from those of the headteachers and teachers of science. Although each category ranked discussion and observation as first, Inspectors, ESA and NEMA officials included experimentation (75%) and demonstration field trips (75%) among the top methods. About 63% of them indicate field trip, excursion, explanation and 50% of them indicated practicals and visits as recommended methods. The methods which were recommended were more learner involving than the ones recommended by headteachers and their teachers.

Relationship between integration of EE in the primary science syllabus and effectiveness of methods used in teaching EE in the primary science syllabus

Cross tabulation between integration of EE in the Primary Science Syllabus and effectiveness of the methods used in teaching EE in the Primary Science Syllabus was also done. The findings are presented in Table 20.

Table 20: Perceived effectiveness of methods used in teaching EE in the Integrated Science Syllabus and Integration of EE in Integrated Science Syllabus

Effectiveness of pedagogical methods used in teaching EE in the Integrated Science Syllabus	Integration of EE in Integrated Science Syllabus		Total
	Very Satisfactory	Satisfactory	
Very effective	25 (43.9%)	1 (1.8%)	26 (45.6%)
Effective	19 (33.3%)	6 (10.5%)	25 (43.9%)
Very ineffective	3 (5.3%)	3 (0.053%)	6 (10.5%)
Total	47 (82.5%)	10 (17.5%)	57 (100%)
Chi-square value	$X^2_o = 8.46$ df = 2 $X_{0=05} = 8.40$		

The findings show an association between integration of EE in the Integrated Science Syllabus and effectiveness of methods used in teaching EE in the Integrated Science Syllabus. The association was significant because at df = 2, chi-square observed (X2o = 8.46) was greater than chi-square critical (Xo=05 = 8.40). Thus, findings show that most respondents (43.9%) who said that the integration of EE in Integrated Science Syllabus was very satisfactory also said that methods used in teaching EE in the Integrated Science Syllabus were very effective. The second largest proportion of respondents (33.3%) who said that the integration of EE in Integrated Science Syllabus was satisfactory also said that pedagogical methods used in teaching EE in the Integrated Science Syllabus were very effective. The implications of these findings are that the more satisfactory the integration of EE in Integrated Science Syllabus was, the more effective the methods used in teaching EE in the Integrated Science Syllabus.

Lesson Observation

Two lessons were observed in each school, one in P.6 and the other in a P.7 class. However, it was not possible to observe lessons in St. Kizito (urban), Abwel and Pajwenda (rural) because of interruption by other school activities. Lesson observations started from evaluating the teachers' preparations of schemes of work and lesson plans. It also included the evaluation of

the teaching materials used, learning process and learners' activities during the lesson. The analysis of the results are presented in tables 21 and 22 below.

Lesson Observations in Urban Schools

A science lesson was observed in each of P.6 and and P.7 of the following schools in Tororo Municipality; Oguti, Rock View, Elgon View and Agururu primary schools. The findings are presented in table 21 below.

Table 21: Rating of lessons on various aspects in the 4 urban schools

	Teacher's plan		Teaching materials		Learning process		Learners' activity	
Quality	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Very effective	0	0	0	0	0	0	0	0
Effective	3	37.5	1	12.5	1	12.5	3	37.5
Satisfactory	3	37.5	3	37.5	4	50	4	50
Ineffective	2	25	3	37.5	1	12.5	1	12.5
Very ineffective	0	0	1	12.5	2	25	0	0
Total No. of lessons observed	8		8		8		8	

From the results in the table, no teacher in the urban school was found very effective in the four aspects observed. Of the lessons observed in the urban schools, 37.5% of them were found effective or satisfactory in teachers' plan and 25% of them were found ineffective in this aspect. 37.5% were satisfactory in teachers' plan and 25% of them were found ineffective. No lesson planning in urban was found very ineffective in the same aspect. The generally weak plans teachers had tended to affect the effectiveness of EE integration at lesson delivery level.

Only 12.5% of lessons observed had effective teaching materials and 37.5% had satisfactory teaching materials. About 37.5% had ineffective teaching material while 12.5% had very ineffective ones. Materials used by teachers tended to impact negatively on the EE integration.

No teacher was found to be very effective during the learning process of their lessons while 12.5% and 50% of the teachers were found to be effective and satisfactory during the learning

process. However, 12.5% and 25% of the teachers were found to be ineffective and very ineffective, respectively, during the children's learning process.

Over 37% and 50% of the lessons were found to have effective and satisfactory learners' activities respectively. About 12.5% of them were ineffective in providing learners' activities. There were neither very effective nor ineffective lessons in this aspect.

The learning process and learners' activities were only satisfactory. These could have been influenced by the level of planning and kind of teaching materials used.

Lesson observation in rural schools

A science lesson was observed in each of the P.6 and P.7 of the following schools in West Budama rural area Achilet, Kisoko Boys, Petta, Paya, Barinyanga, Sesera Girls, Rubongi and Mulanda Primary Schools. Rating of lessons observed in the rural schools were done and the results presented in table 22 below.

Table 22: Rating of lessons on various aspects in 8 rural schools

	Teacher's plan		**Teaching materials**		**Learning process**		**Learners' activity**	
Quality	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Very effective	1	6.35	0	0	0	0	2	12.5
Effective	3	18.7	3	18.7	3	18.7	4	25.0
Satisfactory	4	25.0	2	12.5	2	12.5	2	12.5
Ineffective	4	25.0	6	37.5	4	25.0	3	18.7
Very ineffective	4	25.0	5	31.2	7	43.7	5	31.2
Total No. of lessons observed	16		16		16		16	

In the rural schools, of the lessons observed, only (Sesera P.6) 6.2% was found very effective in teachers' planning and 12.5% very effective in learners' activity. No lesson was found very effective in teaching materials nor learning process. The quality of teachers' planning was generally low and only 18.7% and 25.0% were found effective and satisfactory respectively.

Similarly, the quality of teaching materials was low. Only 14.7% and 12.5% of the lessons observed were effective and satisfactory respectively. The teaching materials of the lessons observed 37.5% and 31.2% were found ineffective or very ineffective respectively.

Only 18.7% and 12.5% of the lessons observed were found either effective or satisfactory respectively in the learning process. However, of the lessons observed, 25.0% were ineffective and 43.7% of them were very ineffective in the aspect of learning process.

About 12.5% of the lessons were found very effective in the learner's activity. But 25.0% and 12.5% of the lessons were found effective and satisfactory, respectively, in the learners' activity. There is a higher percentage of lessons found ineffective (18.7%) or very ineffective (31.2%) in the aspect of learners' activity.

There were generally low percentage in each aspect in both the urban and rural schools. However, the findings show higher percentages of lessons as effective or satisfactory in the various aspects in the urban schools as compared to lessons observed in rural schools. In the rural schools, the findings also show higher percentages of lessons observed as ineffective or very ineffective in the different aspects. Lessons of the urban schools were of better quality than those of the rural schools.

The findings suggest that teachers' planning, provision and use of teaching materials, methods of delivery and learner involvement in urban schools although low were better compared to those of teachers in rural schools. For schools where lessons were effective and satisfactory; the teachers' planning, preparation, lesson delivery and learners' involvements were better. It was established through a study of lesson preparations that lesson plans and schemes of work included basic details but lacked effective objectives, methods and learners' activities. Lessons were developed from an existing schemes of work and lesson objectives were not clearly stated. Most lessons lack variety of learning activities suggested for learners. Lessons tended to develop knowledge and concept of environment but did not encourage learners' participation in environmental conservation activities. It was established through lesson observation that in

some lessons, that learners were not motivated, and teachers tended to hurry to give notes on blackboard for the pupils to copy.

Focus Group Discussion

A total of 180 pupils were involved in focus group discussion covering the areas of their perception of EE, level of knowledge of EE, conservation activities they engage in, methods teachers used to teach EE and the methods they would prefer their teachers to use. The following are the outcome of the focus group discussion.

(a) Learners' perception of EE

Most of the pupils were able to say that EE deals with learning about what surrounds us. Some pupils tended to limit EE to weather as they stated "EE is the study which help us to understand how weather affects us." Other pupils talked of EE as the learning about environmental damages and planting of trees. There was no mention about wetlands in all the focus group discussions.

Generally, pupils showed some rough perception of EE which required further development. They were unable to bring out attributes of EE and conservation practices that could be done.

(b) Level of Knowledge of EE

The pupils were able to give examples of content of EE. These included animals around us, plants, the weather, man and his surrounding, water, pollution of air and water. Some pupils equated EE to learning about game parks and wild animals. One of the pupils stated that EE is the learning about animals in the zoo.

Pupils tended to limit EE to topical contents which they cover during their lessons of science or social studies.

(c) Conservation activities

When asked to talk about conservation activities they participate in, the pupils were not at first clear of the EE related activities. They mentioned written activities they did in science lessons.

With clarification, they were able to list such activities as tree planting, slashing school compound, picking rubbish from compound, preparation of composed manure in science, mulching school garden and planting flowers in school compound.

None of the focus groups, except the one at Sesera Girls School, was able to mention conservation activities done at home after learning about it in school. The Sesera Girls mentioned the cooking to conserve activity, in which through the use of an insulator, what has been boiled can continue to be cooked while in an insulated apparatus.

Methods teachers used

Pupils in a focus group discussion were asked to talk about methods teachers use to teach science. This too was not clear to the pupils at first. But with probing, they were able to give examples of methods such as: Explanation, visiting school gardens, experiments, observing. It is only in Elgon View, Rock View and Oguti Primary Schools where pupils mentioned the excursions and visits to the park and zoo.

Most of the focus groups did not give methods which teachers used to involve them in learning activities. However, some of the methods pupils gave were mentioned by headteachers and teachers during the interview.

Methods pupils preferred teachers to use

Pupils in focus group discussion were asked to mention methods they preferred their science teachers to use. In all the discussion groups, pupils mentioned experiments, observations, visits to the park and zoo, making things and answering questions. It was in St. Kizito and Sesera Girls where discussion groups mentioned about the need for methods which make them work with the community. "We want to learn and work with the people who spoil the environment so that we can correct what has gone wrong," the pupils of Sesera focus group mentioned.

The pupils were not clear of the methods they should be taught EE but they were very defined with the activities they need to involve in. It was clear from the focus discussion that methods teachers used did not involve the learners' participation.

Generally, learners have some flimsy concept of EE and some rough knowledge about it. They require more awareness. All these require effective EE lessons for improvement.

4.6 Challenges and limitations in teaching EE aspects of integrated science in primary schools

Responses to the question on challenges and limitations encountered were limited to only 77 respondents who included inspectors, headteachers and teachers of science in the sampled schools. When the respondents were asked whether there were challenges and limitations faced in the implementation of EE in the integrated science syllabus in primary schools, most of them answered in the affirmative. Some few did not respond to the question. When asked the challenges and limitations encountered by teachers in the teaching of EE in primary science, the responses are as shown in Table 23 below.

Table 23: Challenges and limitations encountered by teachers in the teaching of EE in integrated science

Challenges	Frequency (Out of 77)	Percent (%)
Lack of trained personnel in EE	57	74.0
Lack of funds	45	58.4
Lack of reference books	39	50.6
Inadequate instructional materials	24	31.1
Lack of science equipment	24	31.1
Limited time	18	23.4
Large classes	15	19.5
Lack of motivation	7	9.1
School has small land	8	10.4
Low interest by pupils in EE	6	7.8
Lack of environmental awareness	4	5.8
Lack of integration of skills	4	5.8
Lack of integration skills	4	5.8
Lack of sensitization by resourceful persons	3	4.3
Some teachers lack appropriate methods	3	4.3
Some topics are difficult to integrate	3	4.3
Absenteeism by pupils	2	2.9
Grazing on school land hence its destruction	2	2.9
Lack of garden tools	2	2.9
Teachers lack self initiative	2	2.9
Others (with different specification)	11	14.3

The findings reveal that the majority of the respondents (74.0%) reported lack of trained personnel in EE as a challenge/limitation encountered in the teaching environmental education. This was followed in declining percentage by lack of funds, lack of reference books, inadequate instructional materials, lack of motivation, limited time, school has small land and low interest by pupils in EE. Other challenge and limitations, specified by respondents included large classes, lack of environmental awareness, lack of integration skills, lack of science equipment, lack of sensitization by resource persons, some teachers lack appropriate methods and some topics are difficult to integrate. During the interview with headteachers, they indicated absenteeism by pupils, grazing on school land, hence its destruction, lack of garden tools, teachers lack self initiative, ability of learners is low, demotivated teachers who only look at theory and no practicals, few classrooms, lack of proper furniture, lack of seeds/seedlings, lack of textbooks and most lessons involving EE are taught theoretically were the indicated challenges and constraints. The teachers indicated that lack of refresher courses for teachers, not every school can afford field trips, school programme exam-oriented so pupils are taught only to pass, and unfenced school were challenges and limitations they encountered.

In support of the findings from the questionnaire, an interview with the headteacher of Oguti Primary School revealed that challenges in and limitations encountered by teachers in the teaching of EE in integrated science included lack of apparatus to teach certain things like weather, lack of rock minerals, limited time yet there is a lot to cover, shortage of resources, teachers lack self-initiative and are not well versed, they are demoralized (lack a positive attitude to work). Despite this, the headteacher observed that it is easy because for most of the topics, the children can use their sense and it is relevant to children's experience. An interview with the headteacher of Agururu Primary School revealed that there are no learning aids, there is lack of creativity and methods used are not good, especially the lecture method, textbooks are shallow (they do not give details of environmental conservation), the teachers' concept of environment and integration is weak and teachers do not take out children to observe the environment. An interview with Agururu, Petta and Sesesera Girls Primary Schools teachers revealed that there is no transport, hence it is difficult to take out children for field trips, classes are too big to control, less content in textbooks and little support from parents and the headteacher. An interview with Achilet Primary school teachers revealed similar problems of

insufficient teaching aids due to delays in funding, a lot of time wasted making materials for teaching, little time allocated to EE, and difficult in integrating EE. Meanwhile, the Elgon View Primary School Teachers noted the lack of apparatus for experiments and little time allocated to EE on the time-table.

During the focus group discussion, pupils gave various comments about the challenges in the way they learn about the environment education. They observed that it included travelling long distances without meals (lunch), it involves too much work, which is tiresome. On the other hand, the majority of the pupils like the way environment education is taught because it helps them learn how to keep the environment clean, how to protect it and helps them get opportunity for outings to various places like game parks and to some lakes.

Having identified the challenges and limitations, headteachers were asked what they have done to handle the challenges and limitations. The findings are presented in Table 24 below.

Table 24: How headteachers handled challenges faced in the process of integration of environment education in primary schools

What has been done	**Frequency out of 15**	**Percentage %**
Organising mini-workshops for the teachers	10	66.7
Talking to pupils on the advantage of EE	6	40
Trying to purchase more land for the school	6	40
Trying to change the pupils' attitude	3	20

According to the results in the above table, it is indicated that the majority of the respondents (66.7%) reported organizing mini-workshops for the teachers as a way of handling the challenges faced in the process of integrating Environment Education in primary schools. These were followed by 40% who reported having talked to the pupils on the advantages of environmental education and trying to purchase more land for the school and then 20% who reported trying to change the pupils' attitude towards Environmental Education.

Addressing the challenges

Having identified the challenges and limitations, all respondents were requested to suggest recommendations for effective teaching of environmental issues in the integrated science syllabus. This was a poorly responded to item on the questionnaire. Only 48 out of 80 of the Inspectors, headteachers and teachers responded to this item. The findings are presented in Table 25 below.

Table 25: Addressing the challenges faced in teaching of EE in primary schools

Suggestions for effective teaching of EE aspect in integrated science	**Frequency (Out of 48)**	**Percent (%)**
Have enough textbooks	39	81
More trained teachers	39	81
Increase more time on time table for EE	34	70.8
Have EE competitions	7	35.4
Pay teachers well	7	35.4
Refresher courses	7	35.4
Have seminars	6	33.3
More funds be given to EE	6	33.3
Teaching and learning Aids be available	4	29.2
They be more practical than theoretical	4	29.2
Timetable for EE	34	70.8
Learners should be sensitized on the integration of EE	3	27.0
More training materials	3	48
Advocate for tree planting	22	45.8
Revise teacher pupil ratio	2	25
Provide Wall charts on EE	2	4.2
Others	9	18.7

According to the results in the above table, it is revealed that the majority of the respondents (81%) suggested having enough textbooks and more trained teachers should result into effective teaching of EE aspect in integrated science. Following these, which could be considered as the major solutions for effective teaching of EE aspect in integrated science in order of importance were increase of more time on timetable (70.8%), having EE competitions, paying teachers well and organizing/holding refresher courses each of which had 35.4% of the

respondents. Having seminars, and more funds be given to EE each of which was 33.3% followed as next set of solution. Other solutions, which could be considered are teaching and learning aids be availed, EE to be more practical and learners to be sensitized on the integration of EE. In further interviews with headteachers, they indicated the need for more training materials, advocating for tree planting, revising teacher pupil ratio, using more wall charts, government to provide lunch for pupils, instilling interest into learners and more classrooms to be built.

These were supported particularly by headteachers of Agururu, Sesera, Kisoko Boys, Paya and Banyanga Primary Schools who suggested the need to form EE clubs, organize tours as a sum of the solutions to the challenges and limitations of effective teaching of EE in primary schools. An interview with Agururu Primary School teachers revealed that they need material for use, such as textbooks. During the focus groups discussions, pupils gave a number of suggestions like: Teachers should give them more trees to plant, always take them out to game parks and the zoo and help them form environment clubs.

CHAPTER FIVE
DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The chapter presents the discussion, conclusions and recommendations in relation to the objectives and research questions. It is divided into three major sections. The first section is the discussion, the second conclusion and the third section presents the recommendations.

5.1 Discussion

5.1.1 The extent EE was integrated into the primary science syllabus

The findings revealed that there is integration of EE in the Primary Science Syllabus. Most teachers, headteachers, curriculum developers, Inspectors, ESA and NEMA officials acknowledge the EE content integrated into the science syllabus. The themes, topics and areas of Science where EE had been well integrated were mainly components of the environment, environmental degradation, energy resources in the environment, science at home and community. However, health, weather and water cycle were the areas which most categories of respondents indicated EE integration had not been well brought out.

Thus, basing on Tabaro (1997) and Baron (1994), the implications of these findings are that the areas in which EE were well integrated such as components of the environment, environmental degradation, energy resources in the environment and science at home and community were that the development of curriculum guidelines for these areas were based on aims and objectives of the national environmental education strategy. This shows that during the development of curriculum guidelines in these areas, there was adequate effort to identify career content topics and formulate objectives for EE in these areas.

However, integration in terms of values, attitudes and practices were not picked up well. The objectives of the primary science tended to address content. The findings suggest that while integrating EE in the content areas where it was done in the syllabus, not adequate efforts were put to bring out the development of relevant skills, values and attitudes. The procedures for bringing out these were probably not satisfactorily followed.

The findings regarding areas where EE was well integrated in the Primary Science Curriculum are also supportive of Cormack (1997), who indicated that the curriculum at primary level gives some basis for integrating EE in the teaching of most subjects offered. These areas, when well handled, expose the pupils to the natural environment to enable them acquire practical experiences and favourable attitudes. This means it is not enough to include content, it requires more effort to prepare effective objectives, followed by teachers' choice of methods, which can bring out all the skills, values and attitudes development. The pupils are encouraged to apply scientific and health principles and attitudes in solving some of the everyday problems in their environment. These attributes help to strengthen the general aims and specific objectives for teaching content areas where EE was well integrated in the primary science syllabus.

The findings in table 3 also show that the primary science syllabus themes which carry EE are taught in all classes. Some of them are repeated a number of times in different classes. This approach would probably have given enough opportunity for pupils to interact with content, develop the necessary skills and carried out EE related activities and hence shape up their attitude towards concern to the environment. However, on further look at the manner the topics of the themes are distributed in the classes, a clear pattern does not occur. This, therefore, causes over emphasis of some concepts, unnecessary repetitions without clearly defined progress in development of knowledge, competencies and participation in environmental restoration and conservation activities. This situation is made even more difficult because of the lack of a Teachers' Guide on EE.

There is integration of EE in textbooks for teaching the primary science syllabus. Although most of the books supplied by Ministry of Education and Sports tended to follow the syllabus content and objectives, they lacked the practical approach. The books tend to present EE more theoretically and hence stifling the much needed practical activities in EE. The lack of EE guide which tended to affect curriculum content distribution, also greatly impacting on the way textbook writers presented EE in their books.

The activities given by teachers and those suggested in textbooks did not reflect the ones suggested in the syllabus, which tended to be more routine work. Not much care was given to

their purpose procedure and expected outcomes. One would have expected that the largest concentration of activities guide learners to interact with the environment. Examples of such activities could include field trips to areas which require attention, classroom planning for restoration action, and class projects or restoration activities.

As shown in table 8, of all respondents 89.1% indicated the need for more integration of EE aspects in the Primary Science Syllabus. Human health was sighted as the main areas where more aspects of EE should be integrated. Others in order importance in considering integrating aspects of EE, were environmental degradation, protection and conservation of the environment, components of environment, controlling and managing change, agriculture, social studies, human body, human activities, energy resources, mathematics, monitoring natural and man made resources use, importance of wetlands as a habitant for wildlife, chemistry and management of waste. The mentioning of other subjects here and other science topics in these findings are supportive of Milbrath et al. (1990), who suggested that the experiences used to teach environmental concern be broadened to the multidisciplinary, involve basic concepts and principles, be problem-oriented, address local and global issues and involve hands-on contact with nature.

Although there is satisfactory integrating EE in science syllabus as indicated by results, it was in table 7 and 8, tables 21 and 22 showed that teachers' planning and preparations in all schools (25% in either rural or urban) were ineffective. Lesson preparation fell short of addressing EE issues and its integration. Lesson objectives tended to address only content and lesson activities did not take practical approach. From the lesson observations, most lessons lacked instructional materials related to EE. Objectives in the schemes were quite different from the objectives of the lesson plans. The schemes of work had no or little integration of EE and the concept of EE were often not clear. There was evidence of great need to help the teachers in these areas. According to the results in table 22, in rural schools, (6.3%) of the teachers' planning and preparations was very effective. A study on the schemes of work and lesson plans revealed weakness which indicated inadequate teacher support from headteachers and inspectors.

For the urban schools where teachers' planning and preparation of lessons were satisfactory, lesson plans included necessary details and were developed from existing schemes. However, it was found out that lesson objectives ended up developing knowledge, and the concept of environment were only implied. For the urban schools, where teachers' planning and preparation of lessons were ineffective, it was established that there was no motivation given to continue beyond learning, no motivating activities and notes were given to learners. Relevancies to environmental issues were not well brought out.

There were disparities between urban and rural teachers' preparation of lessons. Lesson objectives, setting, content depth, choice of methods to be used and learning activities planning lessons were weaker among the rural school teachers than their urban counterparts.

5.1.2 Teachers' perception of EE and its integration into primary science syllabus

The research result revealed that most of the respondents in the study had good perception of EE and therefore are able to form a fair opinion of the teachers' perception of it. The teachers of primary science were able to express their perception of EE and what they think it means.

Most teachers had clear understanding of the concept of EE as shown by findings in table 9. A high percentage of teachers (88%) agreed to the statement that EE deals with the process of passing on knowledge, understanding and its conservation practices to the learners, while 62% agree to the statement that EE should help increase participation of learners in conservation activities. EE involved learners working as a problem-solving team to tackle an identified problem; provide means of communicating many of the concepts and its conservation practices; and helps learners develop specific skills and techniques. These include the ability to use scientific approaches, apparatus and measuring instruments appropriately.

This is in agreement with the general view that EE helps to create the interdependence and interrelatedness of environmental aspects and issues. It shows what matters as good practice in the way of handling EE learning. Furthermore, it shows what is involved in doing EE at the development of concept, knowledge, skills and values levels dealing with natural environment.

This means the teachers understand that EE deals with the process of passing on knowledge and understanding, and its conservation practices to learners, prepares learners to become environmentally literate people. EE helps to increase learners' participation in conservation activities. However, there is a general failure of teachers to drive home this in their lesson. This turns their perception more less a theoretical thing.

The research findings also suggest that if teachers handled well EE integration, which would make learners understand better the environmental issues. This would in turn enable them make effective analysis, synthesis and evaluation of environmental issues. These attributes are essential for informed decision making to the level required. This means that "environmentally literate" teachers, Inspectors, ESA and NEMA officials, and the pupils would have the knowledge, tools and sensitivity to properly address an environmental problem in their different capacities and to routinely include the environment as one of the considerations in their daily activities.

In reference to Abid (2003), who asserts that EE helps promote sustainable development and improve capacity to participate environment conservation, the teachers would help the pupils to participate in order to address environment and development issues (such as deforestation, water pollution, air pollution and poverty). But all these sound theoretically existing among the stakeholders in this study. Teachers and pupils observed in schools showed very little concern about the environment even when issues in the lessons directly affect them.

Teachers need to operationalise their perception of the environment. This was because in most schools, both rural and urban, the teaching-learning process was ineffective or very ineffective as revealed by the findings. In addition, the pupils' learning achievement during the lesson in rural and urban schools were low, although much lower in rural schools. Furthermore, a reasonable percentage of primary science teachers and some pupils did not show deeper understanding of the concept of EE, especially as evidenced by the lessons observed most of the learning time teacher was explaining facts. The pupils indicated that there was inadequate time to focus on environmental issues and were taught using only textbooks (theoretically).

Pupils received knowledge of standard facts. Little reference was made to existing relevant situations.

In line with similar findings, according to Engineering Report, 1995, these findings suggest that not enough effort was made to incorporate an understanding of environmental issues into the school curriculum for EE, which should emphasize placing environmental issues at the front end of designs, thinking across disciplines, becoming adept at group problem-solving strategies, improving communication skills, recognizing the relationship between environment and the social/political/economic context in which we live, and making active learning the predominant learning mode. The teachers needed to emphasize learner centred activity during science lessons.

The study further established that in most cases, the ways in which EE is taught reflect the teachers' perception of environmental issues and concepts. The findings are partially supportive of Rose Hulman Institute of Technology and Carnegie Mellon University (2003), which emphasized that the student should learn not only the facts but also develop an understanding about the context, processes, their strengths, limitations and how the issues affect people's lives. Hence correct perception of EE and its integration by teachers is a crucial basis for effective teaching of it. This suggests that environmental issues should be presented in a coherent, yet adaptive and flexible conceptual framework so that students learn as issues emerge. EE aspects should be taught so that its attributes are well developed for the learners' benefits.

In addition, it was established that most primary teachers tried to make the pupils effectively understand environmental issues and concepts. However, this only passed for a few of the urban schools. The reason why all primary teachers should be able to make the pupils effectively understand environmental issues and concepts was that EE focuses on environmental degradation, plant and animal life, vegetation, climate, physical features, soils, as well as air. These are learning aspects which are common in primary science syllabus. The activities carried out in the environment education classes included clearing latrines, burning rubbish, slashing the compound, digging in the school garden and planting trees. Most of these

activities in schools were done at home as well. However, more activities are normally done while at home. They included; burning the rubbish, sweeping the compound, planting trees, cleaning the latrine, slashing the compound and removing stagnant water to stop mosquito breeding. These findings suggest that they use relevant activities and motivational factors such as teaching knowledge in context, learning real experiences, observation and testing, seeing the use and application of what is learnt have been built into the Primary Science Curriculum. What is remaining is the teachers' effectiveness to make them happen.

The study established that to help teachers make the pupils more effectively understand environmental issues and concepts, the following major concerns should be considered: providing enough teaching and learning aids, sensitizing the community on EE; and holding teachers' workshops on EE. Other concerns to be considered included more EE content to be added in the science syllabus, organizing demonstration lessons, reducing pupil/teacher ratio, conducting teachers' refresher courses, and government providing more EE related instructional materials. Others included using big wall charts related to EE, carrying on with educational visits to learning sites, organizing environmental competitions in schools, exposing learners to the natural environment, availing funds to schools, giving teachers sessions on EE, more Continuous Professional Development (CPDs) to be organized. There should be motivation of primary teachers, mutual understanding between teachers and administrators, organizing workshops to sensitize teachers, and encourage pupils to participate more in EE.

It was established that teachers' training curriculum has aspects of EE. It is mainly in the Teacher Education Science, SST and the Agriculture Syllabus. However, the study did not go into finding out effectiveness of these syllabuses during teachers' training. Also it was not possible to establish whether the teachers' curriculum was ever harmonized with the Primary Science Curriculum. Such harmonization is important for the enhancement of teachers' perception and effective teaching in the primary school.

Teachers' perception of EE, its integration into primary science curriculum will greatly be enhanced, if their training offered EE aspects in a more practical and relevant way. Harmonization of primary and teacher education is equally important and necessary for

effective implementation of the curriculum. In order to help teachers understand well the environmental concepts and issues in the primary science curriculum, the following should be done: provide non textbooks materials; orient teachers on EE concepts, provide environment modules, inclusion of EE in PTCs, guide them to produce integrated lessons, writing primary teachers source book and provide enough materials on EE.

5.1.3 Methods primary science teachers use when teaching EE aspects

The study established rather a serious difficulty among headteachers and teachers on the correct perception of teaching methods. They tended to lump together methods, techniques and strategies and referred to them as methods. This is evidenced by presentations of tables 14-17. The teachers' own list on table 17 is even more mixed up. This had impact on the choice, use and taking pupils through important and necessary steps of the process for effective learning. Clear perception of methods has direct influence on choice of materials and learning activities to be used during the instruction process. This situation requires the headteachers and inspectors to have a clear perception on methods of teaching. It is only then that they can effectively support the teachers of science.

The study found out in tables 21 and 22 that the teaching material-resources for the lesson in rural and urban primary schools were ineffective. Ineffective or very ineffective teaching material resources could be partly attributed to either lacking in the scientific or the technological dimensions of environmental issues. The teaching materials and resources used failed to address the contextual basis for environmental issues in the primary science syllabus.

Another possible reason for the ineffective or very ineffective teaching material resources may be deduced from how the teacher preparation handled this aspect during training. There could have been a lack of a coherent training course. Effective training should include the social, economic, organizational and ethical dimensions to bring about the required integration of EE in a more effective manner, especially in selection of teaching methods and resources to be used. Proper use of learning materials are to enable pupils to be capable participants in decision making and restoration activities. Learners should participate in conservation activities at the individual class and social levels.

The learning materials teachers used had a direct link with the methods they used. The most commonly used methods were discussion, observation, explanation, experimentation, demonstration, question and answer as given by respondents. Environmental issues are taught in classroom and outside the classrooms under the tree, in the school compound, through visits to the nearby forests, garden, composite, rubbish pits, kitchen and field trips to the zoo, mountains and lakes. It is interesting to note that "outdoor teaching strategies" and "critical thinking" were not among the most frequently used instructional methods, despite being among the most appropriate methods for teaching environmental education.

IEEP recommends that the methods used in teaching EE should be effective. Some of these are included for teaching environmental issue in primary science curriculum. Such methods encouraged active involvement of learners, made learning to be real and were child centered. This is supportive of Rose Hulman Institute of Technology & Carnegie Mellon University(2003), which observed that to address environmental issues in a professional and responsible fashion, teaching methods need to be "experiential, or hands-on" and provide students with the relevant skills and frameworks, and meet the needs of diverse styles of learning.

There is a gap in the perception of methods, especially by primary science teachers who mixed up methods, strategies and techniques. Before teachers can be expected to select the most effective methods for EE delivery, the correct shopping list needs to be drawn. Teacher education, particularly foundations of education and science education course on methods aspect have to play an effective role. It is only then that effective integration of EE in primary science curriculum shall be achieved.

5.1.4 Challenges and limitations encountered in the teaching of EE aspects of primary science curriculum

It was established that there are many challenges and limitations faced in the implementation of EE in the primary science curriculum in the schools. However, the data gathered was greatly influenced by the open-ended question this particular aspect was sought. The mixing of challenges and limitations could not easily be avoided by respondents. The respondents should

have been asked for challenges separate from limitations. Although it will not be noted that the distinction between challenges and limitation are specific to an identified perspective. The major challenges and limitations encountered by teachers in the teaching of EE in integrated science were lack of trained personnel in EE, lack of funds, inadequate instructional materials, lack of reference books, lack motivation, limited time on the time table, schools having small land, large class enrollment and low interest by pupils in EE.

Other challenges and limitations, which were presented as minor although the researcher considers them very important were large classes, lack of environmental awareness, lack of integration skills, lack of science equipment, lack of sensitization of teachers and other stakeholders about EE by resource persons, some teachers lack appropriate methods, some topics are difficult to integrate and absenteeism by pupils. Both teachers and headteachers mentioned challenges of grazing of animals on school land, hence its destruction, lack of garden tools, teachers lack self initiative, ability of learners is low, demotivated teachers who only look at theory and no practicals, few classrooms, lack of proper furniture, lack of seeds/seedlings, lack of textbooks, most lessons are taught theoretically, no refresher courses for teachers, not every school can afford field trips, school programme is exam-oriented, so pupils are taught only to pass and unfenced school land as affecting the proper implementation of EE aspects in the primary science syllabus.

The findings are in agreement with what has been suggested in the report of community resources for science (2003), which also shared that the challenges of the integrating EE into the primary science curriculum can be multiple, ranging from introducing EE material into the curriculum, to attempting to change teachers' and students' attitudes towards EE issues and concepts. The findings further concur with Mocker and Spear (1982), in that they also showed that many motivations and constraints influence teachers' enrichment choices. They showed that teachers make enrichment selections within a complex framework that includes their personal background and training, the culture and budget of their school, the variety of students in their classroom, social programs and educational trends. All these impact on the way teachers teach EE in the primary school.

The study of learning materials also suggested several drawbacks in the available material from the point of view of a course designed to promote the environmental education for a diverse student population. For example, books tended to have a sketchy treatment of some of the central concerns for EE, lacked a systems perspective, which were key to an integrated approach to EE, societal values were treated in some way in each of the books, there was no attempt to introduce a coherent framework to incorporate the value and ethical dimensions into EE. Lastly, the materials were designed for passive learning of facts by students, rather than to develop and exercise critical thinking and decision-making skills.

The study found out that headteachers handled the challenges and limitations by organizing mini-workshops, although it was not possible to see records to this effect. They talk to the pupils on the advantages of EE. They try to purchase more land for the school. They try to change the pupils' attitude towards EE.

5.2 Conclusions

The Extent of EE Integration in primary science

The findings revealed that there is adequate content integration of EE in primary science curriculum. Most teachers, headteachers, curriculum developers, Inspectors, ESA and NEMA officials were satisfied with the integration of EE in primary school. However, more integration of EE aspects in the primary science syllabus was still needed. The integration needs to take in values, objectives, attitudes and practices. Human health was the main areas where more aspects of EE should be integrated. Others in order of importance in considering integrating aspects of EE were environmental degradation, protection and conservation, components of environment, controlling and managing change, agriculture, social studies, human body, human activities, energy resources, mathematics, monitoring natural and man made resources, importance of wetlands as a habitat for wildlife, chemistry and management of waste.

Perception of EE and its integration in the science syllabus

Most teachers, Inspectors, ESA and NEMA officials and pupils had a clear understanding of the concept of EE. This was because EE improved teachers', Inspectors', ESA and NEMA

officials' and pupils' capability for a contextual and detailed understanding of an environmental issue in order to enable analysis, synthesis, evaluation and decision-making to the level required. Thus, there is environmental literacy among most teachers, Inspectors, ESA and NEMA officials, and the pupils which can further be improved by using appropriate strategies to operationalise.

Despite the positive aspects of integrating EE in the integrated science syllabus, there was a need for more improvement of the level of teachers' understanding of the concept of EE. This was because in most rural and urban schools, the teaching and learning process was ineffective or very ineffective. In addition, the pupils' learning achievement during lessons in rural and urban schools were low.

Methods teachers used in teaching EE in primary science syllabus

The study found out that the teaching material-resources for the lessons in rural and urban primary schools were ineffective or very ineffective, and the pedagogical methods for teaching EE in science were poor. Despite this, the study found out a number of pedagogical methods used in teaching EE aspect. The most commonly used were discussion and observation, explanation, experimentation, demonstration, field trip, discovery, excursion and question and answer. The more hands-on methods and experiential situations were completely lacking. This is heavily attributed to the weak teacher capacity take initiative. Also to a large extent, the lack of accurate perception of EE and its integration in primary scheme.

Challenges faced in teaching EE in the primary science syllabus

It was established that there were challenges and limitations faced in the implementation of EE in the integrated science syllabus in primary school. The major challenges and limitations encountered by teachers in the teaching of EE in integrated science were lack of trained personnel in EE, lack of funds, inadequate instructional materials, lack of reference books, lack motivation, limited time, schools having small land and low interest by pupils in EE. The lack of training of teachers on EE is another challenge that has even caused weak teacher capacity in handling integrated primary science.

5.3 Recommendations

The following are the recommendations drawn from the conclusion: More integration of EE aspects in the primary science syllabus is still needed. Human health was the main area where more aspects of EE should be integrated. Others in order importance in considering integrating aspects of EE were environmental degradation, protection and conservation, components of environment, controlling and managing change, agriculture, social studies, human body, human activities, energy resources, mathematics, monitoring natural and man made resources, importance of wetlands as a habitant for wildlife, chemistry and management of waste.

National Curriculum Development Centre (NCDC) requires taking hold of steps in reviewing the primary science curriculum. This requires taking care of the curriculum objectives clarifying on EE major competencies. Content re-arrangements to cater for ideas of EE, especially in improving our environment for the enhancement of better quality of life. The content and objectives the NCDC shall want to include should be mindful of sustainable development and how learners must be prepared to participate in these therefore:

1. National Curriculum Development Centre (NCDC) shall require to provide effective curriculum materials with adequate guidelines on how to implement EE integrated curriculum.
2. National Curriculum Development Centre (NCDC) shall need to prepare appropriate course books which take care of the EE aspects in the curriculum.
3. Orientation courses shall need to be done to help improve the service teachers' capacity to handle EE integral curriculum.
4. For the pre-service student teachers; Kyambogo University will require producing EE related curriculum. Such a PTC curriculum must be harmonized with the primary science curriculum.
5. Kyambogo University requires intensifying training on the various methods and the steps of the process to use them. There is a serious need to help teachers draw distinction between method, techniques, strategies and activities which help a teacher to effectively use them. Clarity of methods and appropriate choice of learning materials.

6. Ministry of Education and Sports, through its procurement process, needs to provide appropriate textbooks which address EE. It will further require improving upon the serious existing disparity between urban and rural teaching of science in primary schools. Whatever the course of this disparity must be identified through a research and addressed through practical means.
7. Schools should involve our young learners into hands on activities that promote care of the environment. Activities given to learners must be followed up and learners must be motivated and encouraged so as to realize the benefits of participating in EE activities. A lot of EE activities can be achieved through EE clubs.

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APPENDICES

Appendix 1: Questionnaire for teachers

Dear Respondents,

A study is being conducted to assess how the integrated science (with special focus on EE aspects) is performing in Uganda Primary Schools. You have been selected as one of the respondents basing on your role in curriculum implementation in schools. The information you give will only be used for purposes of this research work. You are assured of confidentiality. Please, spare a short time and respond to the following questions:

SECTION A: Background Information

Tick or fill in the appropriate information

1. Sex: Male ☐ Female ☐
2. Level of education:
   (i) Secondary ☐ (ii) University ☐ (iii) Tertiary ☐
3. Professional qualification ……
4. Teaching subjects:
   (i) ……
   (ii) ……
   (iii) ……
5. Classes taught in the last five years
   (i) …… (iii) ……
   (ii) …… (iv) ……
6. (a) How long have you taught integrated science?
   (i) Less than 1 year ☐ (iii) 3-4 years ☐
   (ii) 1-2 years ☐ (iv) 5 years ☐
   (b) In which classes have you taught integrated science?
   ……

SECTION B: Integration of EE in Science Syllabus

7. Is there integration of environmental education in the integrated science syllabus for primary schools?

   Yes ☐ No ☐

8. If yes, which aspects of science have the integration of environmental education aspects in them?

   (i) ……

   (ii) ……

   (iii) ……

   (iv) ……

9. Among your duties, do you check on the integrated science curriculum teaching?

   Yes ☐ No ☐

10. Have you noted whether there is integration of EE in the teaching and learning of the integrated Science in primary schools? Yes ☐ No ☐

11. How would you describe the integration of environmental education in the integrated science syllabus?

    (i) Very satisfactory ☐ (iii) Satisfactory ☐

    (ii) Very Unsatisfactory ☐ (iv) Unsatisfactory ☐

12. Do you think more integration of environmental education in the science syllabus is still needed?

    Yes ☐ No ☐

13. If yes, in which areas of the science syllabus do you think you need more aspects of environmental education to be integrated?

    (i) ……

    (ii) ……

    (iii) ……

SECTION C: Understanding and Conception of about Environmental Issues and Concepts

14. Do you think primary science teachers have a clear understanding of the concept of EE?

    Yes ☐ No ☐

15. Do the ways in which EE is taught reflect understanding (and conception) of environmental issues and concepts? Yes ☐ No ☐

16. During training, did the teachers' training syllabus cover issues of environmental education?

    Yes ☐ No ☐

17. Do you understand the environmental issues and concepts in the integrated science syllabus for primary schools? ` Yes ☐ No ☐

18. If yes, how would you describe your understanding and conception of environmental issues and concepts in the integrated science syllabus for primary schools?

    (i) Very Good ☐ (iii) Not sure ☐

    (ii) Good ☐ (iv) Poor ☐

19. Do the pupils you teach easily understand the environmental issues and concepts that you teach from the integrated science syllabus?

    Yes ☐ No ☐

20. If No, why do you think this is so?

    (i) ……

    (ii) ……

    (iii) ……

    (iv) ……

21. In your view what should be done to enable pupils effectively understand environmental issues and concepts?

    (i) ……

    (ii) ……

    (iii) ……

SECTION D: Pedagogical Methods

22. What are pedagogical education aspects in the integrated science syllabus?

    (i) ……

    (ii) ……

    (iii) ……

23. Do you think these are the most effective ways of teaching environmental issues in the integrated science syllabus?

Yes ☐ No ☐

24. If no, why do you still use the same methods for teaching environmental issues in the integrated science syllabus?

(i) ……

(ii) ……

(iii) ……

25. Which methods would you recommend for effective teaching of environmental issues in primary schools?

(i) ……..

(ii) ……..

(iii) ……..

SECTION E: Challenges and Limitations

26. Do you encounter challenges and limitations in teaching environmental issues in the integrated science syllabus for primary schools?

Yes ☐ No ☐

27. If Yes, (a) what challenges?

……

……

……

(b) What limitations?

……

……

……

28. What suggestions would you recommend for effective teaching of environmental issues in integrated science syllabus for primary schools?

(i) ……

(ii) ……

(iii) ……

APPENDIX 2: Questionnaire for Headteachers

Dear Respondent,

A study is being conducted to assess the integration of EE into the Science Syllabus for Uganda Primary Schools. You have been selected as one of the respondents basing on your role in curriculum implementation in schools. The information you shall provide will only be used for purposes of this research work. You are assured of confidentiality. Please, spare sometime and respond to the following questions:

SECTION A: Background Information

1. Sex: Male ☐ Female ☐

2. Level of Education

   (i) Secondary ☐ (ii) University ☐ (iii) Tertiary ☐

3. Professional Qualification

   Grade III ☐ Grade IV ☐ Grade V ☐ Graduate ☐

   Teacher ☐

4. How long have you been a headteacher?

   (i) Less than 1 year ☐ (iii) 2 - 3 years ☐

   (ii) More than 5 years ☐ (iv) 4 – 5 years ☐

5. How long have you been a headteacher of this school?

   (i) Less than 1 year ☐ (iii) 1 – 3 years ☐

   (ii) More than 5 years ☐ (iv) 4 – 5 years ☐

B. Integration of EE in Science Curriculum

6. Among you duties do you check on the integrated science curriculum teaching in P.6 and P.7?

   Yes ☐ No ☐

7. Is there any integration of Environmental Education in

   (i) Integrated Science Syllabus? Yes ☐ No ☐

   (ii) Textbooks for teaching the syllabus? Yes ☐ No ☐

8. In which topics of the primary science curriculum have Environmental Education been integrated?

(i) …… (iv) ……

(ii) …… (iv) …….

(iii) ……

9. In your work as teachers' supervisor, do you notice whether teachers integrate environmental education during the science lessons?

Yes ☐ No ☐

10. In which topics of the Science Syllabus do teachers integrate EE?

(i) …… (iv) ……

(ii) …… (v) ……

(iii) ……

11. In your opinion what mode does the integration take?

(i) Content ☐ (iv) Attitudes ☐

(ii) Values ☐ (v) Conservation Practices ☐

(iii) Skills ☐

12. How would you rate the teachers EE Integration in Science Lesson?

(i) Very Satisfactory ☐ (iv) Unsatisfactory ☐

(ii) Not Sure ☐ (v) Very unsatisfactory ☐

(iii) Satisfactory ☐

13. What do you suggest the teachers need to do to improve upon the integration of EE in science lessons?

……

……

……

SECTION C: The Concept of EE

14. In your view do you think P.6 and P.7 primary science teachers for have clear understanding of the concept of EE?

Yes ☐ No ☐

15. How do you rate the teachers' concept of EE?

(i) Very satisfactory ☐ (iv) Unsatisfactory ☐

(ii) Satisfactory ☐ (v) Very Unsatisfactory ☐

(iii) Not sure ☐

16. Do you think the primary teachers make the pupils effective understand environmental issues and concepts? Yes ☐ No ☐

17 Do you think the way in which teachers handle EE aspects reflect an understanding and accurate concept of EE? Yes ☐ No ☐

18. The following are arguments about how teachers perceive EE Tick (✓) the appropriate letter weather you (A) Agree (U) are undecided or (D) disagree.

		A	U	D
1.	EE deals with the process of passing on knowledge and understanding and its conservation practices to learners.			
2.	EE is concerned with the preparation of learners to become environmentally literate people.			
3.	EE should help to increase learners' participation in conservation activities.			
4.	The central problem of teaching EE practically is time wasting and requires many other resources.			
5.	When EE is taught using only textbooks (theoretically) it is made to look infallible, received knowledge of standard facts rather than real and natural.			
6.	EE involves learners working as problem solving team to tackle on identified problem.			
7.	EE helps develop specific skills and techniques including the ability to use scientific approaches apparatus and measuring instruments appropriately.			
8.	EE helps to create the interdependence and interrelatedness of EE aspects and issues.			
9.	The major problem of teaching EE is that it requires a great deal of planning preparation and time resourcefulness of the teachers.			
10.	EE shows what counts (matters) as good practice in the way of handling EE learning.			
11.	EE shows what is involved in doing EE at concept and knowledge level develops skills and values for natural environment.			

SECTION D: Pedagogical Methods

20. What methods of teaching do your P.6 and P.7 science teachers use when teaching EE aspects?

(i) …… (iv) ……..

(ii) …… (v) ……..

(iii) ……

21. How do you rate the effectiveness of the methods the teachers use?

(i) Very effective ☐ (iii) Effective ☐

(ii) Not sure ☐ (iv) Ineffective ☐

22. In your view, what methods would you suggest for teaching EE in primary 6 and primary 7.

……

……

……

SECTION E: Challenges and Limitations

23. (a) Are there challenges and limitations your school face in implementing EE in the Science syllabus? Yes ☐ No ☐

(b) If yes, what are?

(i) Challenges

……

……

……

(ii) Limitations

……

……

24. What have you done to handle:

(a) Challenges

……

……

(b) Limitations

……..

……..

25. Do you have any other comments?

……

……

Appendix 3: Questionnaire for Inspectors of schools and members of education standards agency, and NEMA officials

Dear Respondent,

A study is being conducted to assess the performance of primary integrated science (with special focus on Environment Education (EE) aspects) in Uganda primary schools. You have been selected as one of the respondents because of your role in curriculum implementations in schools. The information you give shall provide will only be used for purposes of this academic research work. You are assured of confidentiality. Please, spare a short time and respond to the following questions:

SECTION A: Background Information/Personal data

Tick (✓) or fill in the appropriate answers

1. Sex: Male ☐ Female ☐
2. Level of Education: Secondary School ☐ Tertiary ☐
   University ☐ Others ☐
3. Specify your professional qualification……..
4. What is your designation?.....
5. How long have you worked as inspector of schools or official of Education standards agency?
   (i) Less than one year ☐ (iii) 1 – 2 years ☐
   (ii) 3 – 5 years ☐ (iv) Above 5 years ☐
6. What is your geographical coverage in terms of inspection of schools?
   ……

SECTION B: Integration of EE in Science Curriculum

7. Have you noted whether there is integration of environmental education in the integrated science syllabus? Yes ☐ No ☐
8. If yes, in which areas of primary science syllabus have Environmental Education been integrated?

(i) …… (iii) ……

(ii) ……. (iv) ……

9. Have you noted whether there is integration of Environmental Education in the teaching and learning of the integrated science in primary schools?

Yes ☐ No ☐

10. If yes, in which topics of the integrated science syllabus have Environmental Education concepts been integrated for primary schools?

(i) …… (iv) …….

(ii) …… (v) …….

(iii) ……

11. How would you rate this integration in the syllabus?

(i) Very satisfactory ☐ (iv) Satisfactory ☐

(ii) Not sure ☐ (v) Unsatisfactory ☐

(iii) Very unsatisfactory ☐

12. Do you think more integration of Environmental Education concepts in primary school science curriculum is still needed?

Yes ☐ No ☐

13. If yes, in which areas do you think more aspects of environmental education should be integrated?

(i) …… (iv) ……

(ii) …… (v) ……

(iii) ……

SECTION C: Understanding and Conception about Environmental Issues and Concepts

14. In your view, do you think primary teachers have a clear understanding about the concept of environmental education? Yes ☐ No ☐

15. How do you rate the teachers' integration of EE when teaching the science syllabus?

(i) Very satisfactory ☐ (iv) Satisfactory ☐

(ii) Not sure ☐ (v) Unsatisfactory ☐

(iii) Very unsatisfactory ☐

16. During training, did the teachers' training syllabus cover issues of environmental education?

    Yes ☐ No ☐

17. Do you understand the environmental issues and concepts in the integrated science syllabus for primary schools? Yes ☐ No ☐

18. Do the pupils easily understand the environmental issues and concepts that are taught in the integrated science syllabus? Yes ☐ No ☐

19. In your view, what should be done for primary teachers to make pupils effectively understand environmental issues and concepts?

    (i) …….

    (ii) …….

    (iii) …….

    (iv) …….

    (v) …….

SECTION D: Pedagogical Methods

20. What pedagogical methods do primary science teachers in teaching EE commonly use?

    (i) …… (iv) ……

    (ii) …… (v) ……

    (iii) …….

21. What is your comment of such methods with regards to the effective teaching and learning of EE in primary schools?.....

    …….

22. In your view, what pedagogical methods would you recommend for the teaching and learning of EE environmental issues and concepts in primary schools?

    (i) ……

    (ii) ……

    (iii) ……

SECTION E: Challenges and Limitations

23. Are there challenges and limitations you notice faced by primary schools in the implementation of EE in the science syllabus? Yes ☐ No ☐

24. (a) If yes, what challenges do schools encounter?

(i) …….

(ii) …….

(iii) …….

(iv) …….

(b) What limitations do schools encounter?

(i) ……

(ii) ……

(iii) ……

(iv) ……

(vi) ……

25. What suggestions would you recommend for the effective teaching of EE in primary schools?

(i) …….

(ii) …….

(iii) …….

(iv) …….

(v) …….

Appendix 4: Questionnaire for curriculum developers

Dear Respondent,

A study is being conduced to assess how the integrated science (with special focus on Environment Education (EE) aspects) is performing in Uganda Primary Schools. You have been selected as one of the respondents basing on your role in the curriculum development. The information obtained from you shall only be used for purposes of this academic research work. You are assured of confidentiality. Please, spare short time and respond to the following questions:

SECTION A: Background Information

Tick as appropriate

1. Sex: Male ☐ Female ☐
2. Level of Education:
   - (i) Secondary ☐
   - (ii) Teacher Education ☐
   - (iii) Tertiary ☐
   - (iv) University ☐
3. Professional Qualification:

   Subject specialist: Teacher ☐ Tutor ☐ Others ☐
4. For how long have you done curriculum work?

   1 – 2 years ☐ 3 – 5 years ☐ Above 5 years ☐
5. Were you involved in the development of the integrated primary school science curriculum?

   Yes ☐ No ☐

SECTION B: Integration of EE in Science Curriculum

6. Is environmental education integrated in the new primary school science curriculum?

   Yes ☐ No ☐

7. If yes, in which areas of the primary science was Environmental Education integrated?

(i) …….. (iii) ……

(ii) …….. (iv) ……

8. How would you describe this integration?

(i) Very satisfactory ☐ (iii) Not sure ☐

(ii) Satisfactory ☐ (iv) Unsatisfactory ☐

9. Do you think more integration of environmental education aspects in the primary science syllabus is still needed?

Yes ☐ No ☐

10. If yes, in which areas of science do you think more aspects of environmental education should be integrated?

(i) …… (iii) ……

(ii) …… (iv) ……

SECTION C: Understanding and Conception about Environmental Issues and Concepts

11. In your view, do you think primary school science syllabus covers broadly environmental issues and concept? Yes ☐ No ☐

12. Are the various concepts and environmental issues clear in the Primary Science Syllabus?

Yes ☐ No ☐

13. Basing on the teachers' training and education level, do you think that the teachers' understand the environmental concepts and issues in the Primary Science Syllabus?

Yes ☐ No ☐

14. If no, what needs to be done to help them understand well the environmental concepts and issues in the primary science syllabus?

(i) …… (iii) ……

(ii) ……. (iv) ……

15. Is there need for any other improvement and integration of more environmental issues and concepts in the primary science syllabus? Yes ☐ No ☐

16. If yes, which concepts and issues should be integrated in the sciences syllabus?

(i) …… (iii) ……

(ii) …… (iv) ……

SECTION D. Pedagogical Methods

17. What are the environmental education relevant methods recommended in the integrated primary science syllabus at school level?

(i) …… (iii) ……

(ii) …… (iv) ……

18. In your view, what pedagogical methods are appropriate for integration of EE in the teaching and learning process for primary science pupils?

(i) …… (iii) ……

(ii) …… (iv) …….

Tick the most appropriate

19. In your opinion, are the methods used by science teachers in teaching environmental concepts and issues in the integrated science?

(i) Very satisfactory ☐ (iv) Satisfactory ☐

(ii) Not sure ☐ (v) Unsatisfactory ☐

(iii) Very unsatisfactory ☐

20. What suggestion would you make to improve on the teaching methods for teaching EE aspects in the employed to integrated science syllabus by the primary science teachers?

(i) ……

(ii) ……

(iii) ……

SECTION E: Challenges and Limitations

21. Are there challenges and limitations faced in the implementation of EE in the integrated science syllabus in primary school?

Yes ☐ No ☐

22. If yes, what are the problems and limitations which exists or which are apparent?

(i) ……..

(ii) ……..

(iii) ……

(iv) ……

23. What suggestions would you make for a more effective teaching of EE aspects in integrated science in the primary school?

(i) ……

(ii) ……

(iii) ……

(iv) …….....

Appendix 5: LESSON OBSERVATION

Name of School …….

Class …… Topic …….

Number of Pupils ……

1. Teachers Planning and Preparations

Items to consider		**Low**		**Scores**		**High**	
(i)	Availability of lesson and scheme of work	0	1	2	3	4	5
(i)	Planning reflects EE aims and objectives						
(iii)	Expected learning outcomes are clearly stated and promote EE objectives						
(iv)	Planning integrates EE aspects and links its conservation practices.						
(v)	Planned learning activities are worthy while and will help to bring out the required EE concepts.						
Comments:							

Overall rating

20 – 25 Very Effective

15 – 19 Effective

10 – 14 Satisfactory

05 – 09 Ineffective

00 – 05 Very ineffective

2. Teaching Materials – Resources for the Lesson

Items to consider		**Low**		**Scores**		**High**	
(i)	Evidence of availability of EE related teaching learning materials	0	1	2	3	4	5
(i)	Use made of the available teaching materials during the lesson						
(iii)	Organisation involved during the use of the teaching materials to assist learning process						
(iv)	Use of the school compound, the local environment and external resources to teach this lesson.						
(v)	Ability of learning materials to promote learners' perception and concept of EE						
	Total Score out of 25 marks						
Comments`							

Overall rating

20 – 25 Very Effective

15 – 19 Effective

10 – 14 Satisfactory

05 09 Ineffective

00 – 05 Very ineffective

3. The Teaching Learning Process

Items to consider		**Low**		**Scores**		**High**	
(i)	Lesson addresses specific and clear EE concepts(s)	0	1	2	3	4	5
(i)	Methods used encourage pupils to solve EE problems in their life experiences.						
(iii)	Lesson methods encourages pupils to think for themselves						
(iv)	Pupils are suitably challenged to use the learnt knowledge to solve problems in their own environment.						
(v)	Learners are given opportunities to integrate EE aspect into the learning contents.						
(vi)	Learners are given opportunities to see how EE practical skills and knowledge so far acquired can be applied in environmental conservation activities.						
	Comments **Teachers Activities**	**Learners Activities**					
(a)	Introduction						
(b)	Experiencing Phase						
(c)	Sharing of Experience						
(d)	Evaluation Phase						

Overall rating

20 – 25 Very Effective

15 – 19 Effective

10 – 14 Satisfactory

05 09 Ineffective

00 – 05 Very ineffective

4. Pupils learning achievement during the lesson

	Items considered	**Low**		**Scores**			**High**
(i)	Pace of lesson progress enables most learners to grasp well the EE concept being developed	0	1	2	3	4	5
(ii)	Learners are clear of given learning activities and did them well.						
(iii)	The learners are motivated to continue the learning beyond school time.						
(iv)	Lesson was able to help children take up environmental conservation activities.						
	Total score out of 20 marks						
	Comments:						

Overall rating

20 – 25 Very Effective

15 – 19 Effective

10 – 14 Satisfactory

05 09 Ineffective

00 – 05 Very ineffective

Appendix 6: Lesson Observation

Focus Group Discussion Guide

1. Extent of EE Content in Science Syllabus
2. Concept and Knowledge of EE
3. Methods Teachers Use
4. Methods of Pupils prefer

THE INTEGRATION OF ENVIRONMENTAL EDUCATION INTO THE PRIMARY SCHOOL SCIENCE CURRICULUM

BY

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A Dissertation submitted to the School of Postgraduate Studies in Partial Fulfillment of the Requirement for the Award of Master of Education Degree of Makerere University

April 2008

DECLARATION

I declare that this dissertation is a result of my own independent research effort and investigation. It has not been submitted to any other institution for any award.

Signed: ……. Date:

……..

OBBO-KATANDI Gabriel

3002/HD04/17824

APPROVAL

This dissertation has been approved and submitted for the award of the degree of Master of Education Degree of Makerere University with my authority as a university supervisor.

Signed …… Date ……

DR. JOSEPH OONYU

DEDICATION

This work is dedicated to All My Family Members who gave me all the support and encouragement through the entire course. I know you missed me a lot each time I was working on this research instead of being with you.

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Finally, I would like to thank the headteachers, teachers and pupils in whose schools I conducted this research. Thank you so much.

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ABSTRACT

This study was on the integration of Environmental Education into the Primary School Science Curriculum. The purpose of the study, was to assess ways in which EE integration had been done into the Integrated Science Syllabus for primary schools: methods teachers used to integrate EE aspects in Science teaching, the constraints, challenges and limitations teachers face in teaching the Integrated Science Syllabus; and how all these affected the learners' perception of EE, their environmental literacy and participation in conservation activities.

The study adopted a descriptive cross-section research design of exploratory nature. The population of study included: curriculum developers who participated in producing the Integrated Science Syllabus, Inspectors of Schools both in Tororo Municipality and West Budama County, officials of Education Standards Agency (ESA), National Environment Management Authority (NEMA) officials, District Environment Officer? Teachers in the study areas, male and female primary school pupils in each of the classes primary six and seven. The study involved twelve schools: four of the schools were from the municipality and eight from rural area. Respondents were purposively selected and frequencies, percentages chi-square were used to analyze the data that was obtained.

The findings revealed that there was integration of EE in integrated science syllabus and most teachers, headteachers, curriculum developers, inspectors, ESA officials and NEMA officials were satisfied with it. The themes and topics of science where EE had been integrated were mainly components of the environment, environmental degradation, energy resources in the environment and science at home and community. Health, weather, and water cycle were areas where EE had been well integrated. However, more integration of EE aspects in the primary science syllabus was still needed. Human health was the main area where more aspects of EE should be integrated.

Most teachers', Inspectors', ESA and NEMA officials' concept of EE was satisfactory because most of them had clear understanding of this concept. Despite this, there was need for more improvement in the level of teachers' understanding of the concept of EE. The teaching methods and resources for the lesson in rural and urban primary schools were ineffective or

very ineffective, and thus the pedagogical methods for teaching EE in science were poor. The major challenges and limitations encountered by teachers in the teaching of EE in integrated science were lack of trained personnel in EE, lack of funds, inadequate instructional materials, lack of reference books, lack of motivation, limited time, schools have small land and low interest by pupils in EE.

It is recommended that in order to help teachers understand well the environmental concepts and issues in primary science syllabus, the following should be done: provide non textbook materials, orient teachers on EE concepts, provide environment modules, incursion of EE in PTCs, guide them to produce integrated lessons, writing primary teachers' source book and provide enough materials on EE. For effective teaching of environmental issues in integrated science syllabus, there is need for enough textbooks and more trained teachers. A number of pedagogical methods for teaching EE aspect in integrated science syllabus need to be adopted in those schools, which neglected to use them. These included discussion and observation, experimentation, demonstration, field trip, excursion, project methods, and explanation, in order of importance.