

Master's Degree Thesis
In
Technical Vocational Pedagogy
May, 2012

WORKING WITH TEACHERS AND STUDENTS AT SECONDARY SCHOOL LEVEL TO
ENHANCE BETTER LEARNING OF AGRICULTURE THROUGH PROJECT BASED
LEARNING APPROACH

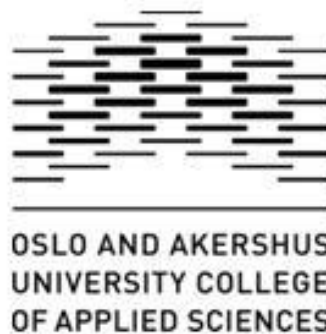
An Action Research at Nabiswa Secondary School, Uganda



By

MARTIN LUTHER OCHAN

Department of Technical Vocational Teacher Education
Faculty of Education and International Studies



COVER PAGE ILLUSTRATIONS

The four photographs that I have used on the cover page were taken during the data collection process. They depict the activities and the working process during the implementation of the research project (project based learning). The picture on the top left shows the students assembling the building materials (sand, bricks & gravel). The top right picture shows the students in their discussion group, while the bottom left and the bottom right pictures show the teachers in the dialogue meeting and some of the piglets that were reared by the students in their project tasks respectively.

COPY RIGHT PAGE

This Thesis is purely my project work, written as part of the fulfilment for the award of Master's Degree in Vocational Pedagogy of Oslo and Akershus University College of Applied Sciences. It forms part of my academic progress and professional development. All rights reserved. No part of this document may be reprinted or reproduced or utilised in any form without prior permission from the author.

Copyright © Martin Luther Ochan, 2012

ochanmartin@yahoo.co.uk

DEDICATION

I dedicate this thesis to my beloved family, especially my wife (Proscovia Akiror) and my children (Divine Moureen Amongin & Delvine Okiror), for accepting to miss me for the period I was away from home, studying Master's Degree in Vocational Pedagogy at Oslo and Akershus University College of Applied Sciences (Norway) 2010-2012. Their patience mattered in enabling me complete my studies.

I also dedicate this document to all those courageous men and women of positive social change activists and to all the Action researchers. I honour and salute you all.

ACKNOWLEDGEMENT

I thank God for His everlasting love, care, protection, guidance and blessings upon me and my family, because without his enabling hand, all what I am doing would not be possible.

I thank myself for the value I attached to this research and working with commitment to ensure that this thesis was produced in time. I deeply appreciate the moral support and encouragement extended to me by **my family** during data collection process. Quite often they would wish to share some time with me but time wasn't enough. Words alone cannot express what I owe them for their understanding towards me.

In writing this thesis, I have drawn a lot of inspiration from my professors (Johan Houge-Thiis & Mustafa Trond Smistad), who have equipped me with both academic and technical knowledge which has enabled me to accomplish the task of writing this document.

With great pleasure, I take the opportunity to thank my immediate supervisor **Johan Houge-Thiis**, for the valuable guidance and advice he often gave to me during and after the data collection process. His willingness to dialogue with me and the timely feedbacks towards my work contributed tremendously towards the successful completion of this research project.

I wish to express my gratitude to the teachers of Nabiswa secondary school, who actively participated in the implantation phase of this research project, especially Gerald Kateza (deputy Headmaster), Kalema Ramathan (Acting Head of Agriculture department), and Julius Oluka (Careers master). Working with you and sharing your experiences was of great help. General appreciation goes to the Administration and the staff of Nabiswa secondary school for providing me and the participants with a good environment and facilities to use during the implementation of this research project. Your friendship and cooperation is greatly acknowledged.

Besides, I would like to appreciate the efforts of my learners (senior three Agriculture students, 2011) because the research project would have not been possible without them. I appreciate the work done by the group leaders (Komo Joel, Bole Stephen, Bumba Habib, Mubale Ronald & Saja Tom), as well as the secretaries of the respective student's learning groups (Namugosa Phoebe, Agira Gloria, Salamula Lydia & Ganda Josephine). You made the innovation a success through your good mobilisation abilities.

I want in a special way to thank my fellow students of Master's in Vocational Pedagogy-English group, 2010-2012 (David Malual, Noeline Komugisha, Lovance Kyarizi, Nhial Kun, James Gatbel, Siddig Hamza and Elfatih Elsharief) for the generous support at every step of this thesis. You have been wonderful to me and I appreciate the team effort.

An honourable mention goes to **Lillian Harvang** (coordinator international section at the university), for she was a mother to me during my stay in Norway. She was always available to give guidance on many aspects like social, health among others. I thank you so much.

I also thank the government of Norway for the scholarship granted to me.

I would like to appreciate my friend Aaron Eyrarn Adjacodjoe, a student of product design at Oslo and Akershus University of Applied sciences for the work he did in designing the drawings that I have used to make some illustrations in this document. Thank you so much.

Last but not least, this thesis contains materials and ideas from articles, books, the web and other sources. I therefore convey special thanks to the authors mentioned in the bibliography page of this document. Your ideas were of great help to me in writing this thesis.

LIST OF ABBREVIATIONS AND ACRONYMS

NGOs – Non Governmental Organisations

NCDC – National Curriculum Development Centre

UNEB – Uganda National Examination Board

PTVP – Professional Technical Vocational Practice

TVP – Technical Vocational Pedagogy

PLE – Primary Leaving Examination

UCE – Uganda Certificate of Education

UACE – Uganda Advanced Certificate of Education

PEAP – Poverty Eradication Action Plan

PMA – Plan for Modernisation of Agriculture

USE – Universal Secondary Education

ABSTRACT

This Study is an Action research approach on Project based learning as a development project at Nabiswa secondary school in Uganda, with fellow teachers and students of Agriculture. It was aimed at improving my practice of facilitating the teaching/learning process in Agriculture, empowering the students with knowledge and skills, as well as learning about project based learning by doing it.

The participants created a project based learning environment with lots of Agricultural tasks performed by the students in groups under the facilitation of the teachers. With the use of various methods, I collected the data for interpretation. Learning in project based approach majorly happens through the mistakes made by the learners in the process of doing tasks. The sharing of the experiences in a reflective way contributes to better learning. Students develop reasoning & problem solving abilities besides team work, leadership and communication skills.

Both the teachers and the students took part in the evaluation process, which focused on student's ability to apply information, the observation of the quality of the work done by the students and the quality of the project reports presented by the learners in dialogue meetings. The innovation yielded positively, and it's important that the activities that the students engage on are relevant, meaningful and built from student's prior knowledge. Quality education can be achieved if the needs of the students and the society are put at the centre of the learning process.

TABLE OF CONTENTS

COVER PAGE ILLUSTRATIONS.....	ii
COPY RIGHT PAGE	iii
DEDICATION	iv
ACKNOWLEDGEMENT	v
LIST OF ABBREVIATIONS AND ACRONYMS.....	vii
ABSTRACT.....	viii
TABLE OF CONTENTS.....	ix
LIST OF TABLES	xi
LIST OF FIGURES	xi
CHAPTER ONE: INTRODUCTION.....	1
1.1 Personal background.....	1
1.2 The existing teaching and learning practices in Agriculture at Nabiswa secondary school and their implications.....	1
1.3 Background of the research project	3
1.4 Purpose of the Study	5
1.5 Statement of the Problem and the reasons for its selection.....	6
1.6 Objectives of the Study.....	7
1.7 Significance of the Study	8
1.8 Major limitations.....	9
1.9 Organisation of the report	10
CHAPTER TWO: THEORETICAL BACKGROUND OF THE STUDY	12
2.1 An over view of Education in Uganda.....	12
2.2 Agriculture in relation to the broad aims and objectives of the Ugandan Education.....	14
2.3 Lecture method as a predominant approach of instruction	18
2.4 Project based learning	22
2.5 Action research	25
2.6 Why Action research in relation to teacher education?	28
2.7 Summary of chapter two.....	29
CHAPTER THREE: METHODOLOGY	30

3.1 Research design	30
3.2 Scope of the Study	31
3.3 The working process	32
3.4 Data collection tools	40
3.5 Summary of chapter three	47
CHAPTER FOUR: DISCUSSION ON THE EXPERIENCES	48
4.1 Knowledge generation in project based learning	48
4.2 Project based learning in relation to other learning approaches in Agriculture	60
4.3 How project based learning improves the learning outcomes of those involved.....	61
4.4 Emerging issues on project based learning approach.	63
4.5 The Action research process	69
4.6 Summary of chapter four	70
CHAPTER FIVE: EVALUATION PROCESS OF THE RESEARCH	71
5.1 The evaluation process with the students:.....	71
5.2 The Evaluation process with the teachers:	80
5.3 Feedback from the learners:	85
5.4 The evaluation of the Action research process:	86
5.5. The validity and reliability in the research.....	89
5.6 Summary of chapter five.....	92
CHAPTER SIX: REFLECTIONS, RECOMMENDATIONS AND CONCLUSION	93
6.1 REFLECTIONS AND THE LESSONS LEARNT.....	93
6.2 RECOMMENDATIONS	98
6.3 CONCLUSIONS.....	99
LIST OF REFERENCES	100
APPENDIX A: PIGGERY	103
APPENDIX B: LOG SAMPLE	107
APPENDIX C: TEST QUESTIONS USED DURING EVALUATION PROCESS WITH THE STUDENTS	109
APPENDIX D: APPRECIATION LETTERS FROM THE STUDENTS TO ME REGARDING THE RESEARCH PROJECT	111
APPENDIX E: INTRODUCTORY LETTER FROM THE UNIVERSITY	115

LIST OF TABLES

Table 3.1 (Project proposal form).....	37
Table 3.2 (Log format).....	45
Table 5.1 (Task sheet).....	78
Table 5.2 (Performance assessment form).....	82
Table A1 (Record keeping in piggery).....	106

LIST OF FIGURES

Figure 2.1 (Structure of Uganda Education system).....	13
Figure 2.2 & 2.3 (Pictures on the mode of student's practical assessment by UNEB).....	16
Figure 2.4 & 2.5 (Pictures showing sitting arrangement in lecture teaching method).....	18
Figure 2.6 (Illustration on teacher centred teaching-learning approach).....	20
Figure 3.1 (Circle of Action research and reflection).....	33
Figure 3.2 (Picture of a pig).....	44
Figure 3.3 (Picture of students treating a piglet).....	44
Figure 3.4 (Picture of students & I in a group discussion).....	44
Figure 3.5 (Picture of a student displaying his group work).....	44
Figure 4.1 (Illustration on step by step learning process).....	56
Figure 4.2 (Illustration on students who preferred trying things by themselves).....	57
Figure 4.3 (Illustration on the interactive process in project based learning approach).....	62
Figure 5.1 (Diagrammatic representation of the Research process).....	87
Figure 5.2 (Spiral Action research cycle).....	88

CHAPTER ONE: INTRODUCTION

This chapter contains a detailed overview of the research background and lessons learnt in the previous projects. It gives a brief description of my personal background and what has motivated me to examine my practice as a teacher of Agriculture and working towards improving it. It points out key aspects of the existing teaching and learning practices in Agricultural education in Uganda with Nabiswa secondary school being at the centre of focus. The chapter presents the purpose & the problem statement for which the research was undertaken, as well as the objectives that guided the research activities.

1.1 Personal background

I am a graduate of Vocational Studies in Agriculture with Education obtained at Kyambogo University in Uganda (2002-2005), and currently pursuing masters in Vocational Pedagogy at Oslo and Akershus University College,(2010-2012). For the past six years, I have been actively involved in the teaching and learning of Agriculture at both lower and upper secondary school levels in Uganda, specifically at Bethany High school, St.Mbuga Vocational secondary school and Nabiswa secondary school.

Within the same period of time, I had the opportunity to participate in the assessment of student's academic performance in Agriculture at national level. In this short time interval, I gathered much experience in the Ugandan education sector, more so in Agricultural education. This is one of the motivating factors for me to venture and discover more in my practice as a teacher (educationist). I also do some collaboration with NGOs in assisting famers to cope with emerging challenges in Agriculture.

1.2 The existing teaching and learning practices in Agriculture at Nabiswa secondary school and their implications

The research was conducted at Nabiswa secondary school-Uganda. Nabiswa secondary school is a community based secondary school supported by the government of Uganda. The lower secondary school level is made up of four classes (senior one, two, three and four), while the upper secondary section is made up of two classes (senior five and six). The school operates on

traditional curriculum which is managed by the National Curriculum Development Centre (NCDC¹).

At senior² one and two, the students are expected to do twelve subjects, Agriculture inclusive. At senior three and four, students are expected to do a minimum of eight subjects and maximum of ten subjects, of which seven of these subjects are compulsory (Chemistry, Biology, Mathematics, Geography, English, Physics and History). This means that doing Agriculture at senior three and four is by choice for the students.

The teachers of Agriculture teach according to the syllabus drafted by the NCDC. The content which is guided by the syllabus is not so specific for secondary students and therefore students learn at a wider perspective. Students learn general knowledge of crop science, soil science, animal science, farm mechanisation and management (NCDC, 2008). Though students gain from wider knowledge, it gives burden to the learners. Sometimes at work or even at the course level of studies, the students may choose to work with only one of the areas in the curriculum.

At the end of senior four, the students are subjected to national examinations conducted by the Uganda National Examinations Board (UNEB³). Specifically, in Agriculture, they do two sets of exams, one being theory paper and the other being practical exam. There are no specific methods that have been earmarked for the teaching and learning of Agriculture in Uganda and therefore the choice of the methodology for the delivery of the content depends on the choice of the individual teacher.

Since the choice of the methods for teaching and learning depends on the individual teacher, the dominant pedagogy for Agricultural education remains talk and chalk (lecture), with few demonstrations on how certain tools are used in the farm. The teaching is largely teacher-centred, dominated by factual materials, abstractions, and dictation of notes. Students take up the passive role and only memorise what the teacher said in class, without reflecting on the application of such knowledge in real life situations.

¹ NCDC is a body in charge of designing and developing the national curriculum in Uganda.

² The word Senior in the Ugandan context is used to mean secondary or High school. Instead of saying secondary one, we say senior one.

³ UNEB is a body in charge of the assessment of student's learning at national level in Uganda.

The consequence of the nature of the education ends up with students coming on the job market with unsuitable qualifications and attitudes. In most cases, the students will be very desperate and will go into anything just to survive. This further affects their productivity and efficiency, because what they opt to do for a living may not be of their passion or ambition.

What would seem to have an impact in my own opinion would be starting off the training of the young people for employment early in life, especially given that the government of Uganda embarked on universal⁴ primary and secondary education which is free for all citizens. The educators would take this opportunity to place emphasis on practical activities besides the academic training.

1.3 Background of the research project

This document is built from project one, two and three. Project one was all about Self exploration in relation to my practice. Project two was all about exploring the relations between my own and relevant professional technical plans, ideology, practice and the needs of my society. The understanding of the needs of the society in relation to my professional vocational practice helped to provide a significant foundation to guide me in identifying the challenges within my practice. It also helped me to understand the conformity of my practice to the utopian practice and consequently the needs of my society in relation to my practice as a teacher of Agriculture were identified.

The documentation of project two was based on my experience in the teaching and learning process in Agriculture and the existing teaching and learning practices in Agriculture at Nabiswa secondary school as highlighted in the first part in this chapter. This was done in comparison with the way vocational learning practices are conducted in secondary schools in Norway.

With this experience in mind, I developed the impression that the products of schooling (students/learners) are more theoretical and less skilled because possibly the schools they attend do not empower students to think creatively and productively for themselves and therefore, I feel that many young people can learn far more that would be useful to them and to the society, if education is carried out in a more practically vocational approach.

⁴ Universal is a word that is used in the Ugandan education context to mean general free education for all the school going children at both primary and secondary levels.

Some of the important “gaps” which I was able to identify while trying to assess myself and my practice include;

- The chalk and talk (lecture) approach of teaching betrays my learners as the students do not get enough time to be involved in the learning process.
- My own level of motivation and for the students in the learning process was low and learners lack the self- drive towards learning and achievement of own goals.
- The activities that I used to organise for my students were individualistic in nature and driven towards self-satisfaction and meeting the demands of the school; for example, ensuring that more students pass in grade one and also early syllabus coverage.
- My learners lack enough exposure to enable them to link new information with known one. This could be attributed to lack of relevant learning materials to enable them (students) to link the theory with real life practice.
- My working environment and practices have no linkage with the industry where the students can see and appreciate the value of learning Agriculture.
- Counselling aspect in the teaching and learning of Agriculture was missing. Throughout my practice, as a teacher of Agriculture, I had the view that it was my role to direct the learning activities as students wait on the receiving side.

As a result of the study (project two), I started to have the thinking that education institutions, whether of higher level or lower level should educate the students to become well informed and deeply motivated citizens, who can think critically, analyse problems of the society and take on social responsibilities in the real life perspective. In the learning of Agriculture, this forms the foundation for the utopian practice. The needs of the society which were identified and possibly be addressed by the education in Agriculture are;

- Income generation for sustainability and poverty reduction through engagement in Agricultural activities like poultry keeping, piggery among others.
- Creation of jobs for Self- employment to absorb the large numbers of the unemployed youth, given that Uganda largely depends on Agriculture.
- Education for rural development in terms of the infrastructure and social development.
- Food security, being able to sustain food production to meet the demands of the increasing population.

In an attempt to understand how I can contribute towards skillful training of the students as a teacher, I opted for project three. Project three was based upon the findings from project two and focused on the identification, analysis, discussion and documentation of several options for innovative improvement of my Professional Technical Vocational Practice (PTVP) as a teacher of Agriculture at Nabiswa secondary school-Uganda.

The whole discussion revolved around how I could actively work with my home institution in reducing the identified “gaps” in my practice. In this case, I was able to carry out an investigative inquiry into readiness of my home institution (Nabiswa secondary school) to work towards improvement and hence laying the foundation for this Action research (Master’s Thesis).

With much of my teaching – learning process in Agriculture having been theoretical, yet the education policies of the country do not limit on the methods of learning, I felt that taking simple steps towards improvement of my practice through improving on the teaching learning methods would be of great value to me. I therefore became inspired to carry out an Action research on project based learning as a development project at Nabiswa secondary school, which has further helped me to understand and improve my practice as well as empowering the students to think creatively and productively.

Over the past years, the government of Uganda has made interventions to see that performance in science subjects including Agriculture improve at secondary school level but not much has been achieved in the skilful training of the students. Key Vocational education in Uganda is implemented at tertiary level, while general academic teaching happens at secondary school level, yet many of the products (learners) of secondary school level may not reach tertiary level. This therefore calls for early build-up of skills amongst the learners.

1.4 Purpose of the Study

The purpose of the study was to create a technical vocational development project on which to apply the concepts of Technical Vocational Pedagogy (TVP). Embedded in this project are three important attributes; improvement in both my practice as a teacher of Agriculture and the learning outcomes of Agriculture students, with the hope of interacting with the different policy makers at various levels about bettering the learning of Agriculture at secondary school level.

Therefore, by undertaking to do an Action research on project based learning as development project, I had the belief that new experiences in my practice would be created to generate more knowledge hence improving upon my repertoire of action in practical teaching and training situations. It was also aiming at shifting my role as a lecturing teacher to a facilitator of learning, where the responsibility of learning process rests upon the learners.

Bjerknes, (2002) noted that meaningful learning only takes place through personal involvement by the students, when it's self initiated and the learners evaluate to see whether it leads to what they want to know or meet their needs. With this, it's clear that the Study was intended to help improve my teaching / learning approaches towards being learner centred.

Through this kind of development research project, students are supported in the learning process. The process of working with projects in itself inculcates in students the sense of small income generating Agricultural ideas and specific skills that allows them to be integrated back into the society after school as contributing participants, impacting positively on the economic, social, physical and vocational aspects of their lives. This goes well with students who fail to advance with their studies to higher levels and are forced to drop back to the community.

1.5 Statement of the Problem and the reasons for its selection

How can I use project based learning to improve on both my practice and the learning outcomes of Agriculture students at secondary school level in terms of knowledge and skills?

With real life experience as the starting point, I think and believe that the method offers students the knowledge and skills that are transferable to a wide range of situations, as well as becoming lifelong practicing Agriculturalists. Knowledge and skills matter a lot if the country is to gain progress economically and socially.

Ausubel, (2000) as cited by Bjerknes, (2002:07) maintains that “the most important element in the learning is what you know from before”, which demands action and reflection (Bjerknes, 2002). Bjerknes further concluded that knowledge exists in action and not in theory. This was one of the core motives while working with colleagues as we shifted from the predominant lecture method to project based learning approach.

Agriculture as a science subject appreciates the process of discovery, citing the way different varieties of crops are often developed in relation to environmental conditions. Unfortunately, the commonly used lecture approach of learning puts it as a factual subject to be memorised. There is need to move towards Agricultural instructions that encourage students to question how we know and what we know in a reflective way.

Kyriacou (1997) argued that effective teaching involves both the sound understanding of how and why certain activities lead to learning, and the factors that have influence on the effectiveness of such activities. This is something that makes teaching such a unique profession, though some people have the conviction that anyone with the subject matter can teach.

With over 75% of the rural population in Uganda being involved in Agriculture, I am optimistic that the introduction, implementation and the expansion of project based learning as an approach of instruction at secondary school level will not only enable us to learn and re-improve on our practice as educators but also equip the learners with self- sustaining skills in Agriculture, through their involvement in vocational based hands-on Agricultural activities at secondary school level. The students should see how they can apply content in real world situations.

1.6 Objectives of the Study

The Study was guided by the following specific objectives;

- 1) To improve my practice as a teacher of Agriculture at Nabiswa secondary school through the introduction and implementation of project based learning style, where concepts of technical vocational pedagogy are applied.
- 2) To improve the learning outcomes by the students of Agriculture at Nabiswa secondary school in terms of knowledge and skills.
- 3) To assess the effectiveness of project based learning style in Agriculture in the context of our school system where student numbers are high or rather to learn about project based learning by doing it.

1.7 Significance of the Study

(A) To the students:

The whole essence of this project work was geared towards having students engaged with hands - on activities as they learn in order to foster both their mental and physical abilities. This also helped them develop skills, and an understanding of responsibility that will prepare them for life in the society. Based upon my past experiences, it meant moving from knowing that.....to knowing how ...? And also from absorbing factual knowledge to developing competence which is related to managing project innovations and problem solving.

(B) To the teacher:

The study enabled us the teachers to learn about project based learning by doing it through the process of Action research. Elliott (1991) as echoed by Altrichter et al (2008) defined Action research as the study of a social situation with a view of improving the quality of action in it; where he further stressed that in Action research, theories are not validated independently and then applied in practice, but rather they are validated through practice.

This therefore means that Action research lies in the will to improve the quality of professional practice and I think this definition agreed with my Idea of working with colleagues in introducing and implementing project based learning because we as practitioners (teachers) learnt to cope with the challenges and problems in the practice of facilitating teaching & learning within the practice itself and carrying on with the innovations in a reflective way.

The teachers can make an important contribution to the knowledge base of their possessions through Action research, (Altrichter et al, 2008). I got convinced that carrying out an Action research on project based learning would enable other teachers and me to reflect on our practice to strengthen and develop its positive futures while acting within the system.

By undertaking an Action research on project based learning, other teachers and I were able to gain a more comprehensive view of practice situation, developed action strategies to bring about improvement through periodic evaluation of the outcomes of our effort. At later stages I would expect to share the experiences with the public and consequently involving different stake holders in education in dialogue on the possibilities of the expansion of the innovation.

(C) To the school and the community:

Since this was a research based development project, two things were salient in it; the research process and the development part of it. It is a research because I, along with other participants got involved in investigating the suitability of the actions in it. It's developmental because it came along with change or improvement. Students took up major activities in pig production. The sale of some products as a result of project activities resulted in the generation of income for the school, which has been helping so much to finance other activities within the Agriculture department at the school.

The innovation has also improved on the social relations between the school and the community, because most of the resources that were used by the students in their project activities came from the community while at the same time, students sold back their products from the projects such as the piglets that had increased in number to the community.

The community will also benefit directly as the students who are the major participants in the research process are expected to duplicate the experiences from the project activities in their respective communities, thus leading to community development.

1.8 Major limitations

Generally, there were quite a number of factors that were constraining in the process of data collection, which might have impacted on the process of data collection and the interpretation of the research outcomes or the experiences encountered. Some of the limitations can be clearly understood in the discussion of the results. But briefly some of the outstanding were;

- The time frame for data collection, physical engagement with the participants and the learning environment was fairly short. Ideally the process of data collection as per the school program was supposed to last for six months but within these six months, one month was taken off for student's vacation, while another one month was dedicated as examination time for the students. This was beyond my control. Some project tasks needed much more time to be concluded and then reflected upon. If much time was available, possibly we (participants) should have had more experiences.

- Resources were never enough. For example there was need for some textbooks for the students to refer to and the money to buy some of the materials used in project activities. There was need for protective wear for the students while performing project tasks but since the students were many, the school could not provide for all. Because of lack of such protective wear, some students would shun work in fear of getting dirty. This could have negatively affected the effective participation in project tasks.

- The organisation of the school system (congested work plans limited student's participation). Subjects to be learned by the students were spread throughout each day; this seemed overloaded for the students, as it normally affected their working time with the project tasks. The case was not different for the teachers since they would have varying time schedules, therefore organising dialogue meetings with them was difficult.

- The nature of the curriculum itself was limiting because the content to be learned by the students was already predetermined, so students had limited choice for their project tasks. The time for completion of the curriculum topics was already stipulated; the summative mode of assessment always diverted student's attention to look for the information that would enable them pass examinations other than understanding or experiencing. This can lead to wrong data being collected or the data risks being misinterpreted.

1.9 Organisation of the report

Chapter one was all about the presentation of the research background, including lessons learnt from the previous projects from which this research project is built. It presented my personal background, an outline of the existing teaching-learning practices at Nabiswa secondary school and the motivating factor for me to undertake an Action research on project based learning. Chapter one spelt out the purpose for which the research was undertaken, the problem statement and the objectives that guided the research activities.

Chapter two is the theoretical background of the research project. It makes use of the ideas from different sources to back up and clarify on issues surrounding the research project, such as the issues surrounding Education in Uganda in general, the lecture approach of teaching/learning since its predominantly used in most schools in Uganda, review of ideas regarding project based

learning and it also presents some arguments and analysis of Action research as a methodology used in the implementation of the innovation.

Chapter three is the methodology. It spells out the materials and the methods used in data collection, and the design of the research project. It gives a narration of the working process used in the implementation of the research project.

Chapter four is where the experiences encountered during the working process with the innovation (research project) are presented, discussed and analysed. It looks at how learning takes place in project based learning approach and other issues that emerged as a result of implementing the innovation.

Chapter five presents analysis of the evaluation process of the research, aimed at understanding the extent to which the research project and the activities done answered the problem statement and the objectives that guided the research process. The different approaches used in the evaluation process are discussed.

Chapter six is all about the summary of the research and personal reflections regarding to the whole process of the research, highlighting key learning points. This chapter also presents recommendations for future actions concerning the project and then I made general conclusion about the research project in this chapter.

The last part of this document contains the list of reference material used in the research and extra information (appendices) that I could not put in the main body of the research report.

CHAPTER TWO: THEORETICAL BACKGROUND OF THE STUDY

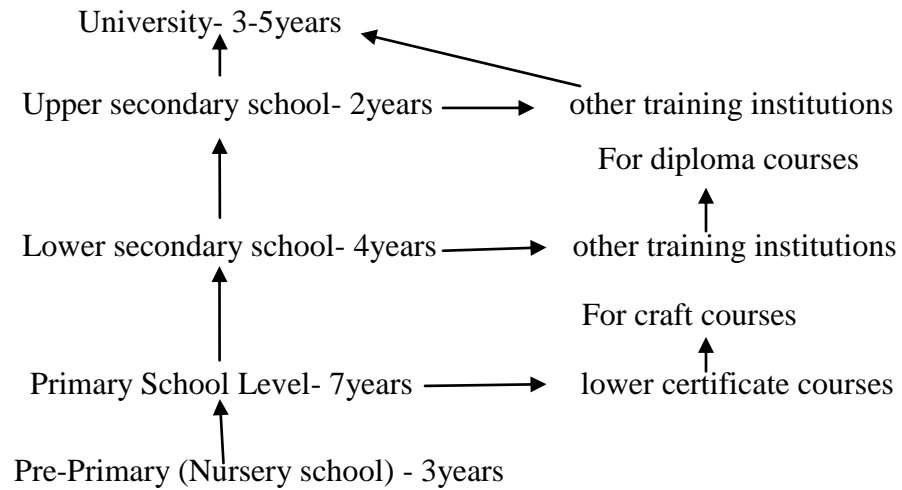
This chapter makes use of the ideas from different sources to inform my thinking regarding to the area under investigation. By so doing, it enables me to make connections between the Study and the existing theories, which enhances better understanding on the issues surrounding the Study. It provides an understanding as to why it was necessary to work towards the improvement of my practice as a facilitator of student's learning at secondary school level.

2.1 An over view of Education in Uganda

The paper presented by the Uganda national curriculum development centre at the annual national head teacher's workshop (NCDC, 2009), on curriculum review in secondary schools spells out that the current lower secondary education curriculum is an inheritance from the colonial era and has not undergone any fundamental review. Consequently, it has not kept pace with the changing situations and circumstances at both the national and global levels. It's the Uganda national curriculum development centre which is responsible for curriculum development for both primary and secondary school levels.

The increasing number of the jobless youth could be a reflection of students not acquiring the skills, knowledge and competences needed for either the world of work or further education. They are usually taught only to pass examinations. The curriculum and the syllabus give guidance principally on what to be taught (content). The content is the same as introduced to secondary schools over three decades ago (1971), during the East African Examinations council days, (NCDC, 2008). Despite all this, the good news is that the teachers have been given the freedom to use his or her creativity in the learning process.

Fig.2.1. Brief structure of Education system of Uganda



The Uganda national examination board (UNEB) does the assessment of learning at primary, secondary and some tertiary institutions. Examinations are given as a way of determining one's progress from one educational level to the next. For primary school level, their examination, commonly referred to as primary leaving examination (PLE) is given at the end of primary education. A given pass mark is determined for any student who is to continue with education at lower secondary school level.

Students who proceed to lower secondary school are subjected to national exams after four years, which will lead to the award of a certificate (UCE). The results of this examination are used by different schools to admit students to upper secondary school or other training institutions. Those who would have succeeded with upper secondary school will again do national examinations after two years and will lead to the award of a certificate (UACE). The results at this level are used for admission to the post secondary institutions, like the universities and colleges.

The government policies on PEAP (poverty eradication action plan), PMA (plan for modernisation of Agriculture) and USE (universal secondary education) greatly demand that there should be knowledgeable and skilful Ugandans who can participate meaningfully in the implementation of these policies (NCDC, 2008). This in part could be achieved through Agricultural education, because I believe that the educational experiences one goes through have a lot of bearing on knowledge and skills acquired.

2.2 Agriculture in relation to the broad aims and objectives of the Ugandan Education

Agriculture is the driving force of Uganda's economy. It's the major source of the country's foreign exchange earnings and supplier of raw materials for agro-based industries. In addition, it's the main source of food, income and employment for the majority of the country's population. Most parts of the country have fairly fertile soils and suitable climatic conditions that favour Agricultural production. This natural endowment makes Agriculture an essential basic tool for the country's economic growth and poverty eradication.

While making analysis of the aims and the objectives of studying Agriculture at secondary school level as per NCDC, I found out that the aims are good and recognise Agriculture as the backbone of the economy of Uganda. To them (NCDC), the students having studied Agriculture at secondary school level should be able to relate the value of Agriculture to food security and welfare of the family, school, the community and the nation and possession of basic principles and skills in Agriculture to enable him /her manage Agricultural enterprises profitably for self reliance and contribute to Agricultural modernisation.

The question then comes; with all these excellent aims of teaching Agriculture at secondary school level, and given the fact that over 75% of Uganda's population depends on Agriculture for livelihood, why has productivity remained low? Can the education system partly be held responsible for the outcry?

One way in which Agricultural technologies can reach the farmers is through the school education system; where by the students of Agriculture can serve as outreach agents. Students can play this role by passing on the knowledge, information and skills acquired at school to the farmers in the communities where they live. These students can disseminate Agricultural technologies if they are provided with sufficient knowledge and skills that can easily be transferable.

To try to answer this pertinent question, I interacted with students, teachers, parents and different stake holders in their various capacities in and around the school. The interaction was in form of conversations regarding to issues related to education in Uganda. With teachers, I always

brought up the conversations regarding to education in Uganda during dialogue meetings and lunch time periods since all the teachers would converge in the staff room⁵ for lunch.

The aim of such interactions was to create an informed mind while working with project based learning approach, so that the participants become aware of what was possible and not possible at the time. Through these conversations, I learnt that the problems facing education in Uganda are as a result of different factors at diverse levels; though not very far from what I had identified in my project three (*refer to research background pages 3-5*). The different categories gave their opinions pertaining to the education sector, which I have summarised below;

(A). Government factors:

Through the making of policies that are not tested for workability. No much follow up of those policies is made to relate their relevance to the society. The ideal way would be for those involved in policy making to have regular Action researches at grass root level, to ascertain what works and what does not work. For example the declaration of free education at both primary and secondary levels; it was a good idea but there was need to have much capacity building before the implementation, like the availability of resources and teachers. This expanded on the already existing problems within the education sector.

The organisation of the curriculum; Not much has been done to review the curriculum to meet the demands of the society, industry and the world of work. Imagine situations where content is fixed and the time for completion of such content is structured. This not only puts the teachers on pressure to complete the syllabus, but it would also mean that the intention is to have the students pass through the system other than the actual learning.

Remuneration of teachers: I do appreciate government's effort towards the remuneration of teachers, but I feel a little more is demanding on the teacher's welfare. Teachers need to be motivated to the level where they can realise some job satisfaction. In this way, they may work satisfactorily to achieve the good objectives in our curriculum and government programmes.

⁵ Staff room is a common room for all the teachers within the school, where the teachers gather to share lunch and other events, which could be discussions, meetings or even relax themselves.

The mode of assessment: The existing mode of assessment places emphasis on theory rather than learner's abilities. The implication of this is that teachers are tempted to use methods of teaching that encourage memorisation, such as lecture method. It is now a common phenomenon for teachers to “coach⁶” students on the way to pass exams and use chalk and talk method of teaching, even in subjects which are practical, like computer studies. Teachers need to be involved in continuous assessment of the learners at school level, since they are the ones who deal with the learners on daily basis.

Figure 2.2 & 2.3: Pictures on the mode of student's practical assessment by UNEB



Fig.2.2



Fig.2.3

An example I can refer to in relation to the mode of assessment is the recently concluded lower secondary school national examinations (2011) in Agriculture (paper two) which is a practical exam. The pictures in fig.2.2 & fig.2.3 give an idea of what takes place. Students were to be provided with materials (specimen), these materials included water, engine oil & grease, which the teachers were to label as G, H, I respectively.

The questions that followed were; state where and for what purpose each specimen⁷ is used in a farm tractor; describe the properties of each specimen which make it suitable for its function;

⁶ Coaching is a word that has been used in the context of the Ugandan education system to mean the specific guidance given by the teachers to the students on the way to pass and excel in the national examinations.

⁷ Specimen is a word commonly used to mean the materials or objects presented to the students in practical examinations.

state one common way in which the efficiency of each specimen may be reduced (UNEB, 2011:527/2). My major concern is in the relevancy of the questions to the learners.

The questions are based on the imagination that students in their respective schools make use of tractors on school farms and the teacher is expected to have taught this, which may not be the case. It all goes back to studying about things which may not have much meaning to the society, because the learners come from the society where simple traditional tools are used for farming and may not work with tractors in the rest of their lives since they are expensive.

Kyriacou (1997) attributes this to difficulty in translating educational aims into product variables, which leads to many research studies focusing on the most easily accessible and reliable measures of educational attainment (standardised tests & examinations). This kind of thinking leaves out some aspects learned by the students. Making an assessment based on the product is not enough because it ignores the activities performed to come up with the product.

(B). Learner and community factors;

Learners have got negative attitude towards practical (vocational) subjects which would empower them with self sustaining skills. While working with students in project based learning, I noticed that students did not want to become dirty in the process of engagement with some project tasks. How then will someone learn Agriculture, get the necessary skills without being involved in doing it? This is the same belief held by parents as they prefer their children to study for white collar jobs (office jobs), which are now scarce with the ever increasing population.

Poor learning skills by students; they do not prefer the kind of learning that stresses them. For example, engaging them in research and digging out knowledge. They are not self driven in the learning, yet knowledge creation and retention is high when learners are much more involved in the learning process. Kyriacou, (1997) recommends an increase in active learner's involvement not only because it fosters better understanding, skills & increased transfer of learning but also because of its beneficial effects on motivation and attitudes towards learning.

The society holds the belief that the teachers have to do all to ensure that their children are educated. They never make a follow up of how their children learn. Those who bother to check their children's books, only pay attention to how much content has been covered and whether

there is red pen by the teacher showing correct or wrong. They feel safe with subjects with the most coverage in terms of notes.

(C). Teacher factor;

This is my point of interest as a facilitator of student's learning. All the teachers whom I interacted with were in agreement that to some extent, we the teachers have in one way or the other contributed to the poor upbringing of the learners. Poor mastery of content; where teachers never update themselves with current knowledge. To make it more clearer, the teachers use the same notes which were used by their former teachers ten years ago while teaching them (commonly referred to us "yellow notes" because they have stayed for long). Teachers are not innovative enough to move with the current pace of the global demands.

Teachers still employ the old methods of teaching and learning. They majorly use lecture approach, with less or no practical lessons, and they lack commitment to their profession. In most cases, people who go for teaching as a profession do not do this because they desire but because they failed to qualify for other courses of their interest at university level. So they end up in the teaching profession. The implication of this is that the newly qualified teachers will join the field to facilitate the learning of students for the sake of earning a living.

2.3 Lecture method as a predominant approach of instruction

The dominant pedagogy for Agricultural education remains chalk and talk at Nabiswa secondary school, and most likely in the rest of the country, despite the ineffectiveness of the approach in equipping the students with the relevant knowledge and skills.

Figure 2.4 & 2.5 Pictures showing sitting arrangement in lecture teaching method



Fig.2.4



Fig.2.5

The pictures in fig.2.4 & fig.2.5 were recently taken from Nabiswa secondary school, to help in the illustration of the kind of environment during the teaching-learning process with the traditional chalk and talk approach. In this kind of arrangement, it's possible to have teaching taking place but with minimal learning taking place.

I remember sitting in one of my high school classes not so far from now (twelve years ago), listening to the teacher lecture in one of the lessons in Agriculture. He could usually talk for the first half of the lesson and followed by “marathon of notes” being dictated in the last half of the lesson of 80 minutes. This was on routine basis. As time for the national examinations approached, the teacher would intensify on “coaching” us especially on how to tackle the answering of questions, commonly termed as question approach. Reason being that specific words and formats was of interest to the examiners; this implies that it is mandatory for the student who is answering exams to please the examiner as he does the marking.

My teacher would definitely do this knowing that if more of us (students) passed the examinations, he would be rewarded by the school financially and therefore he had to do everything possible to ensure that students pass in the national examinations. At times this was done by revising previous paper questions of the past years with the hope that the same questions would repeat in the upcoming examinations.

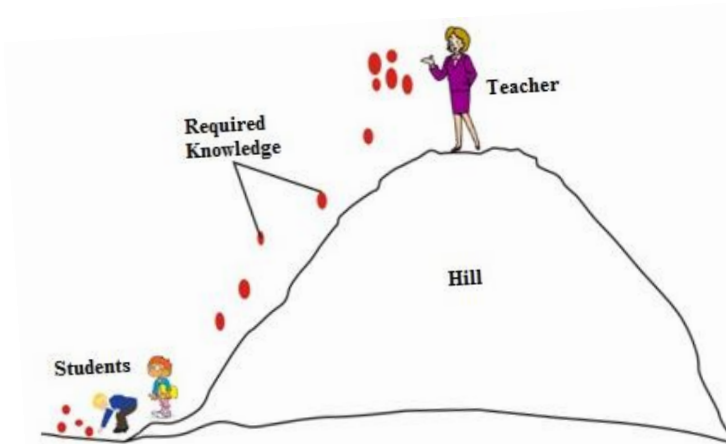
Little did I know that I would fit in the shoes of my former teachers by becoming an Agriculture teacher as well! During my work as a teacher, (last six years) and while interacting with fellow teachers, I learnt that what we were doing (the practice of teaching) was a replica of what our former teachers used to do. The teachers acknowledged that what they do in classroom situations is to memorise what their teachers used to do to them and reproduce the same knowledge to the present students. What we (the teachers) have forgotten is that we are now operating in a totally different environment, which possibly requires new approaches to teaching-learning.

The liberalisation of the education sector to include allowing private schools operate alongside government schools has enormously contributed to competition within the education sector, where by performance in the final examinations matters if a given school is to attract parent's attention. This further makes the teaching to be more oriented towards passing examinations.

Schools continue to use paper and pen tests as a soul tool to measure intelligence. This promotes the use of lecture approach as a primary teaching method, resulting in a learning process which is primarily based on memorisation. Scott, (2005) referred to them as book smart individuals or straight “A” students. The implication of this according to Illeris (2007) is the failure by the learners to develop a sense of judgment, independence or responsibility as they are always told what is wrong or right.

This all goes back to how teachers and students decide to conduct the learning process. My experience confirms that learning lies in the hands of both the teacher and the students.

Figure 2.6: Illustration on teacher centred teaching-learning approach



The illustration above corresponds to the common way of teaching, which is teacher centred teaching, though sometimes it is referred by others as lecture method (chalk & talk). It is one way mechanism of teaching/learning. It is based on the assumption that the required knowledge is on the hill together with the teacher (meaning that it is the teacher who possess the needed knowledge). The learners humble themselves at the bottom of the hill and request the teacher through the learning process to provide them with that much needed knowledge.

The teacher throws the needed knowledge to the learners through chalk and talk. Students may find it difficult to grasp the concepts because some of the knowledge may not be relevant to them. The process also implies that the learners are on the receiving side, though some of the students may fail to create meaning out of that knowledge. Billett (2001) , asserted that “as we

think and act, learning takes place”. I don’t think whether learning takes place in this situation because both thinking and acting are minimal.

In one of my consultative workshops with the learners, they lamented on how the teachers move at a faster rate while teaching using lecture approach. This brings the implication that some of the knowledge given to the learners may actually be missed or may need a lot of recalling. Since they are perceived as “receivers”, the learning process may not necessitate them to learn how to climb the hill (search for knowledge on their own). It’s only the teacher who knows, but because students don’t openly disagree, it doesn’t follow that they agree (Gordon, 2003).

In this kind of teaching /learning, a teacher is seen as an expert who conveys his knowledge to novices who acquire and accumulate that knowledge (Ortrun, 2009: pg. 31). Ortrun compared this to a professor pouring a jug of information into an empty vessel, which is the student’s head. Ortrun further described this as “input, process and output”, where by input is determined and prescribed arbitrarily by experts; output being measured in examinations where the most successful method of passing examinations is rote learning, no matter whether it leads to understanding or not.

The focus in the lecture approach is on what is to be taught rather than the child who is taught, such that the whole process is seen as working through the syllabus, than trying to help develop each child’s potential (Farrant,1980). Farrant adds that the emphasis is on teaching rather than learning, with teachers seeing themselves as communicators of knowledge to their learners.

In this case, one wonders whether learning takes place in terms of knowledge and skills or not, yet according to Scott, (2005: pg.5) the society requires individuals to be active learners who are able to solve problems. Our schools need to reflect on what the society expects of its citizens. If we are to develop schools that learn (Senge et al, 2000), where learning is part of everyday living, then the way of teaching and learning needs to be improved, to shape student’s development as learners and not consumers of knowledge.

To achieve this, Scott advocates for application in the learning process as he asserts that when application and problem solving are left out of the learning process, student’s quickly forget information. He adds that problem solving requires thinking and thinking requires work and when one applies information to solve problems, he is more apt to retain it.

Arvind, (2010) reported that an important aspect of learning is knowledge creation. Kolb, (1984) as cited in Arvind, (2010:11) seems to agree with this as he defines learning as a process by which knowledge is created through transformation of experience. To him, better learning occurs in the process of doing, observing, thinking and planning next course of action.

Arvind again notes that learning and knowledge are interlinked, where he says that when one learns, he or she gains the knowledge. This would mean that knowledge is not possible without learning and the end product of learning should lead to knowledge; which at the same time should lead to lifelong learning, where the learner shows mastery of the way of self-improvement, (Senge, 2000). A large population of the learners still graduate from secondary school level with limited capability in practical involvement in challenging world situations.

Probably the introduction and implementation of project based learning in Agriculture, right from lower secondary school level would be the immediate answer to the skilful upbringing of the learners. Project based learning enhances learner's achievement in the learning of Agriculture beyond the school level.

2.4 Project based learning.

The term project as used in Agricultural practices may refer to “a unit of work” and almost all the major tasks performed in Agriculture are in relation to projects. Relating to the field of learning and education, different literature have expressed differently about project based learning, though the ideas appear to be similar.

The project learning institute (Oracle Education foundation) as quoted in SRI international⁸, (2009), defined project based learning as a systematic teaching model that engages students in learning knowledge and skills from a series of complex tasks including designing and planning, problem solving, decision making and the communication of the results.

BIE⁹, (2012) looks at project based learning as a systematic method that engages students in learning essential knowledge and life enhancing skills through an extended student influenced inquiry process structured around complex, authentic questions and carefully designed products

⁸ SRI International is an independent, non-profit research institute conducting [client-sponsored research and development](#) for government agencies, commercial businesses, foundations, and other organizations

⁹ BIE means Buck Institute for Education <http://www.pbl-online.org/About/whatisPBL.htm>

and tasks. They added that the aim is to help students learn key skills such as collaboration, communication and critical thinking.

Project based learning involves assignments that call for students to produce something, such as product design or design an experiment, with analysis and interpretation of the data (Michael and Felda, 2007). They added that the culmination of the project is normally a written or oral report summarising what was done and what the outcome was. Michael and Felda, (2006) noted that in Project based learning, the questions always provide the context for learning which is usually collaborative with active involvement of the students in the learning process.

Jones et al, (1997) as cited in Arvind, (2010:pg.16) perceives Project based learning as a model that organises learning around the projects. According to Arvind (2010), Project based learning is aimed at imparting problem solving abilities, team work and boosting self esteem on those involved. It's the purest form of differentiated instruction (Schlemmer et al, 2008), where by students are allowed to learn and demonstrate understanding in ways that take advantage of their strengths and support their weaknesses.

All in all, I see project work as a means of engaging students in exploring curriculum topics and developing important skills such as communication, team work, among others. Scott, (2005) simply noted that students need to produce a document while working with projects. But it's not only about producing a document; this must include the aspect of making presentations, discussions and reflecting on the experiences to create knowledge.

In projects, students discover the reality of what they learn by working together to solve complex, real world problems, rather than being taught facts from books. Scott, (2005) is in agreement with this as he asserts that there is need for individuals to know how to solve real life problems and become a team player. He recommends the educators to change their view of knowledge and focus on teaching the life skills.

In order to achieve this, Scott is of the view that educators at high school should integrate project activities and field based experiences into their curriculum so that students are engaged in solving real life problems. Simkins et al, (2002) reported on some important dimensions that should govern project based learning to include; the core curriculum (which must point the basic

skills for all the learners), it should be connected to the real world, have a time frame, collaborative and having students involved in the decision making process.

The role of the teacher in this case changes into facilitating learning processes by supporting and stimulating individual and group learning, through dialogue, discussion, experience sharing and observation (Arvind, 2010). Scott, (2005) adds that the educator's role is to help students identify an appropriate project and once students begin work, help them find the necessary information that will move them forward in the discovery process. It's all about empowering the students to be more creative and more receptive to becoming independent thinkers and problem solvers (Darla, 2008).

The discussions above suggest that project based learning is an alternative teaching method, where learning is organised through projects for acquisition of knowledge and skills. It's also clear that project based learning is activity based, with a driving question that serves to drive the tasks that meaningfully address the driving question. In simple terms, project based learning represents learning by doing and therefore it's a comprehensive instructional strategy to engage students, teachers and other participants in collaborative investigation.

They plan, design and implement (Scott, 2005). He (Scott) adds that the process provides the students and the teachers with the opportunity to explore new ideas and develop new ways of doing things in their classrooms. This is attributed to the fact that the process of project planning, designing and implementing new ideas requires some kind of pattern of inquiry and thinking. In fact Scott concludes project based learning to be an effective tool for engaging students in Dewey's pattern of inquiry (Experiential learning).

It's also worth mentioning that project based learning advocates for experience based learning, with the teacher being the facilitator of the learning process. It targets to bring the aspect of creativity amongst the students, as they try to combine knowledge generated from team work, which in itself comes with positive attributes like decision making skills among others.

Bearing in mind that today's students enter into the workforce that demands more knowledge and skills, I am convinced that the use of project based learning in the learning of Agriculture helps to bridge the gap between the knowledge and skills needed for future success, as opposed

to the common approach of learning (chalk & talk) which is defined to impart a fixed body of knowledge rather than initiate lifelong learning and foster creative thinking amongst the learners.

2.5 Action research

It's imperative to note that I wasn't studying about Action research but I used it as a methodology to help me in making an inquiry into the possibilities for improvement in my practice through the introduction and implementation of project based learning as part of my teaching-learning approach in Agriculture. But it is also important that I show my understanding of Action research in relation to the already existing theories on it and why it became of interest to me in the field of education and teacher improvement.

The term Action research seems to have been in existence many years back though I came to know about it at master's level. This could have been probably due to the fact that most Universities in Uganda engage more on other kinds of academic researches, where students imagine of a certain problem, develop some research questions and later make an investigation which ends with the submission of the report.

While attending to lectures at master's level, it was common for such words like Action research to always suffice. I remember very well how it often generated arguments within the classroom on what exactly it means.

Elliott, (1991) as cited in Altrichter et al, (2008) found Action research to be the study of a social situation with a view of improving the quality of actions in it. He further stressed that in Action research, theories are not validated independently and then applied in practice, they are validated through practice.

This is not far from what was reported by Greenwood and Levin, (1998) of Action research being a social research carried out by a team, encompassing a professional Action researcher and members of an organisation or community seeking to improve their situation. To them, the aim is to promote broad participation in the research process while performing specific actions that lead to a more just or satisfying situation for the stake holders.

While analysing the two contributions, it is clear that the focal point in Action research is the definition of the problem at hand and when this is defined, members involved co-generate

relevant knowledge that leads to relevant actions to bring about improvement of the situation and this may imply acting within the situation in which they are trying to understand and improve.

Karin, (1999) reports that Action research, was part of the work of social scientists in Latin America, Africa and Asia which emerged as part of the democratisation process in communities and work places aimed at developing new ways of empowering the oppressed. He (Karin) goes on to explain that Action research projects have been initiated in small communities, where the objective is to develop reliable knowledge amongst the oppressed in order to construct counter availing power to change the economic and social situations.

I still think that what Karin reported on Action research rotates around the people themselves with the problem coming together, generate knowledge which leads to actions geared towards solving the problem. It's all about making people own the problem, and generating ideas together to address the problem. Altrichter et al, (2008) agrees with this as he notes that the whole idea is to gain a more comprehensive view of the situation, develop action strategies to bring about improvement and evaluate the outcomes of their effort.

Ortrun, (2009, p.g106) on the other hand defined Action research as a critical collaborative enquiry by reflective practitioners, being accountable and making the results of their enquiry public, self evaluating their practice through engagement in participative problem solving and continuing with professional development.

The term Action in itself means performing a task or taking certain measures on a given task, while research on the other hand is making an inquiry into something. Action research would therefore mean the process of “actively” making an inquiry into a given situation. Actively in this case means that the members involved go through the process of systematically analysing and interpreting the situation as it prevails.

Never the less, when I reflect upon the different assertions about Action research by various scholars, and then merging with my own experience of learning to be Action researcher by doing it, something clear is that in Action research, a given situation has to prevail in a way that may not be satisfying the practitioners, this provokes them to make an inquiry into it, targeted towards improvement. This would also mean putting themselves in the situation or getting immersed in it, experience with it and then reflecting upon the actions taken to bring about improvement.

In fact, it's a research approach based on bringing benefit or change for those involved and not just making a report. Action research can be seen as a means of transforming the society to bring constructive change, which is meaningful and deeply felt (Gail et al, 2001). It is therefore, a kind of research that yields information needed for improvement in practice. Ortrun, (2009) argues that it integrates action (change) and research (explanations and understanding), but warns that its suitability depends on the task at hand.

Greenwood and Levin, (1998) are of the view that Action research involves a conjunction of three elements; Research, Action and Participation. I agree with Greenwood on the basis that no research or action can be taken without participation, but the aspect of reflection is also important in the process of inquiry. Because to be able to progressively bring social change, we have to progressively reflect on the previous situation, the current situations and relate to the future. With this done, then we can think of what actions to take.

Altrichter, (2008: pg.8) argues that "to be a good Action researcher, you need to learn to reflect on what you do, speculate on the possible implications of every situation and generate theories to be tested in action". Ortrun, (2009: pg.56) re-echoes that reflection on experience, whether good or bad, successful or unsuccessful is vital. Norton, (2009) holds a similar view as she asserts that reflecting on practice as part of an Action research cycle is essential for the achievement of any enduring change because of the way it transforms the previously held assumptions, to the adoption of a new framework.

Something that still puzzles me then is the possibility of one individual engaging in Action research because much of the available literature emphasises collaboration. Ortrun, (2009) perceived it as a methodology which can be used when dealing with sentient human beings, particularly groups of people, organisations, communities, societies, whose characteristic ideas are difficult to predict. But I think the ownership of the problem matters most. The question is who owns the problem in Action research? What if my insight tells me there is a problem, and the rest do not see it as a problem, despite your explanation! Does the Action research stop then?

To a smaller extent, I think it doesn't matter if one person owns the problem and he goes ahead to take action to solve such a problem. But to a larger extent, while applying the concept of systems thinking (Senge et al, 2000), which advocates for the whole rather than parts, then the

idea of collaboration in understanding the interrelation between issues and different factors becomes very fundamental. It's likely that the problem identified doesn't stand in isolation. In such cases, the sustainability of the long term solution necessitates making connections between factors.

2.6 Why Action research in relation to teacher education?

Relating to the work of the teacher, Action research offers an opportunity for the teachers to share experiences and ideas about improvement in practice. Norton, (2009) argues that the purpose of Action research in the pedagogical perspective is to help in the investigation of own practice of facilitating teaching-learning, with the aim of improving it to benefit student's learning. In this case, teachers will learn to be learners in their own practice.

Altrichter et al, (2008) maintains that the royal road to Action research is to explore it by doing it yourself and the key to being a good is not, however, just a matter of acquiring skills, but the importance of understanding the research process as an art to be continuously perfected rather than a set of procedures that can be applied un-problematically. I see it as action intended to help the practitioner researcher to cope with the challenges and problems of practice and performing innovative ventures in a reflective way. As teachers, it helps us to reflect on and in our practice to strengthen and develop its positive features.

“One of the fundamental benefits of doing teacher research is the opportunity it affords us in perceiving our world a little more freshly” (Gail et al, 2001:pg.7). Therefore, through action, teachers come to understand what is really happening in their classrooms. They (Gail et al, 2001) further elaborated that doing something as one is studying it can play a central role in classroom based teacher conducted research. Action research therefore places the teacher as a designer, implementer and solver of his own problems. It is a good idea as it brings better understanding and job satisfaction in me as a teacher.

Gail et al, (2001:29) believed that Action research is a natural part of teaching and that effective teaching is informed by personal knowledge, trial and error, reflection on practice and conversations with colleagues. They looked at the teacher as an observer of students, who studies classroom interactions, to explore a variety of effective ways of teaching and to build conceptual frame works that can guide ones work.

With the changing times which place a teacher as a counsellor (Bjerknes, 2002), and where students are expected to take charge of their own learning, the role of Action research in this case is demanding. Both the teacher and students will then have to dialogue in a reflective way so as to bring about learning which is oriented to the needs of the society. Constant evaluation of the practice is needed.

Ortrun, (2009) summarises it all as he put it that with Action research, one does not just create knowledge for the sake of knowledge creation, but to try to improve practice by making positive difference that impacts on practice and to gain an insight and knowledge to further future learning.

2.7 Summary of chapter two

This chapter made analysis of the different issues surrounding the Ugandan education system, ranging from the curriculum and the challenges hindering the achievement of the goals within the curriculum. It made analysis of the traditional lecture approach as the predominant teaching-learning method used in most schools in Uganda, where the major focus is what is to be taught rather than the child who is to be taught.

This chapter made use of different literature to bring an understanding of project based learning as one way to facilitate better learning amongst the students of Agriculture. It looked at project based learning to include important steps like; problem identification, identification of activities to address the problem, taking actions with the identified activities and then making reflections on experiences to bring about learning.

The final part of this chapter looked at the understanding of Action research process by different scholars and then my own arguments as to why it was necessary to use Action research as a methodology in this research process. Arguments made present Action research to include; the establishment of the problem by those involved, undertaking of certain measures in a participative way to address the problem, making evaluations of the actions performed in a democratic way and then re-improving the actions as members search for the lasting solutions to the problem.

CHAPTER THREE: METHODOLOGY

This chapter presents detailed narration of the approach that other participants and I used in the study. It gives a description of what happened in terms of the actions taken and why such actions were taken in the research process and in some instances what was learned with such actions.

3.1 Research design

The Study was basically a qualitative Action research, and was aimed at bringing developmental improvement in the department of Agriculture (Nabiswa secondary school), in terms of the way the teaching and learning of Agriculture is conducted within the school premises. Ortrun, (2009) points out that Action research as a methodology provides a means of understanding about what under pins and influences human actions for sustaining or improving practice. Since the issue of improvement was dependent upon other factors, it necessitated collaboration with other stake holders to make connections to different factors.

Norton, (2009) argues that due to the cyclical nature of Action research, it is possible to introduce change and refine the next cycle of the research based on experience and reflection, which according to Norton may not be possible with experimental methods because they are based on tightly defining and controlling variables that do not allow the process of fine tuning. I think the point which Norton was trying to make here is the aspect of flexibility in the research process, which of course forms part of the important attributes of an Action research.

Being a social research which entails interacting with the people and the environment, this was the major reason why I chose to work with Action research at the expense of other methodologies. The participants created a Project based learning environment with lots of Agricultural tasks performed by the students under the facilitation of participating teachers. With the use of the different methods, I collected the data for interpretation. The findings are discussed and presented in chapter four in relation to the experiences encountered, available literature, and the research objectives.

3.2 Scope of the Study

The research project was implemented within the Agriculture department. Four teachers took part in the research, these include: Kateza Gerald (Deputy Headmaster in-charge of administration and also a teacher of Art and design), Oluka Julius (career's master and also a teacher of physics), Kalema Ramathan (acting head of Agriculture department and also a teacher of Agriculture) and myself (teacher of Agriculture). The other major participants were students of senior three (third years) who are doing Agriculture as a subject (56 students).

The students of senior three were chosen because of their level of studies at that time (2011) which places them at an advantaged position to enable us make follow up with the innovation this year (2012) when they are in senior four. Student placement in different learning groups was randomly done, with respective group leaders voted in democratically by members of the specific group. The Study did not limit on other teachers who were willing to take part.

The content of the study was guided by the objectives of the research. The content used in project based learning was by choice by the learners, but they had to choose from within the curriculum of the Uganda National Curriculum Development Centre and the National examining body (UNEB). This was because, being a new innovation at experimental level; we had to work through integration approach and avoiding much conflict with the existing systems but rather concentrate on learning from the experiences and reflecting on the possibilities of working with the innovation at general school level.

It's also worthy to note that the Study was built from previous projects (1, 2 &3) and will lead to the award of masters in Vocational Pedagogy of Oslo and Akershus University College of Applied Sciences. Elementary preparations were documented in project three and therefore the Study focused majorly on the implementation of some of the agreed ideas between the home institution (Nabiswa secondary school) and me. For academic reasons, the research ran from June 2011- June 2012, but follow up will be made for the possibilities of re-improvement and expansion of the ideas at different levels. This may involve dialogue with stake holders at different levels.

3.3 The working process

As already noted in chapter one under the background of the research project, this specific project (Master's Thesis) is built from project three, which I wrote at the end of year one of the Masters Studies. The major focus was the identification, analysis, discussion and documentation of several options for innovative improvement of my PTVP as a teacher of Agriculture at Nabiswa secondary school.

The whole discussion revolved around how I could work actively with my home institution in narrowing/decreasing the identified "gap" in my practice to bring about the needed improvement. By so doing, project three acted as an investigative inquiry into readiness of my home institution to work towards improvement. This laid the foundation for this master's thesis by mapping out the possibilities for the implementation of the innovation.

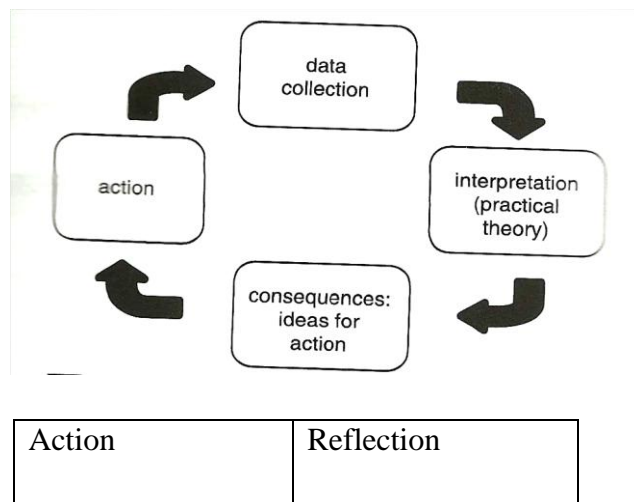
This was the genesis of this research project. The other different stake holders and I were able to identify and discuss the factors surrounding the improvement process (introduction and implementation of project based learning). We were also able to look into the conditions necessary for the implementation to take place by making connections between the project ideas and the existing systems, values and cultures of the people around the school.

"As facilitators of society transformation, we have to first learn the perspective of the people, come down from the feeling of knowing things to a feeling of learning from the people and working according to their needs " (Varun and Patricia, 2005:42). It's through this background that I felt that collective reflection with the home institution in exploring the possibilities to initiate change was of paramount importance.

This was done by way of making telephone calls to consult with the various stake holders within the institution. This was appropriate at the time given the low level of technology in and around the home institution, since all this was happening while I was still in Norway. I also made use of relevant literature from text books and on line documents to back up the ideas about the innovative improvement. For example, I had to read more about project based learning, Action research, learning theories and literature related to the change process. This was aimed at creating an informed mind to foster mature discussions with those involved in the process.

When it came to the actual implementation of the research project at the home institution, I opted to use the module of Action research developed by Altrichter et al, (2008:8), referred to as the circle of action and reflection. I made use of this module almost throughout the Study and it was highly appreciated by the participants, because we perceived each activity as a task legible to deep analysis at every stage for further actions.

Fig.3.1: The circle of Action research and reflection (an extract from Altrichter et al, 2008:8)



While making use of the above “circle”, the first action that I undertook was to organise the first workshop with teachers, nine of them turned up. Jokingly, I asked them to let me know of their expectations during the workshop! This elicited laughter amongst the teachers as one of them posed a question, “How do you call us for a workshop and then ask for our expectations?” this was fun but definitely they wanted me to talk about Action research and project based learning.

I then introduced myself as a learner who needed collaboration in the learning process. I went on to brief the gathering on the theories behind the innovation. The purpose of these actions was to bring all the intending participants to a common understanding of the whole process. By so doing, it helped me in identifying those teachers who were interested in taking part in the research process, seeking their acceptance and fixing the dates for the proceeding workshops.

By the second workshop, the number of the teachers had reduced to four. So we drew up the agenda for that particular workshop. Included in the agenda was making a follow up of the issues discussed in project three on the possibilities for improvement in practice as teachers.

At this point, I posed three questions to the members that helped to guide the discussion;

- Do you acknowledge that certain gaps exist in our practice?
- Looking at our practice, is it in line with the overall objectives of the National Curriculum Development Centre (NCDC)?
- What has created this gap?
- What is your opinion towards improvement?

These were indeed fundamental questions as they kept us focussed throughout the Study period. They provided what I would call “ice breaker”. They formed the basis for self assessment in practice and more scrutiny of the problem statement. It became apparent that there was need for improvement in practice to foster better learning by the students. The participants unanimously noted that there were “gaps” in our practice especially in the way the teaching-learning process was being facilitated and that we had a role to play as teachers, but also the education system and the community needed to play their part.

There was demand by the members to understand the concept of Project based learning and Action research, so I provided copies of the available literature on both Project based learning and Action research, which we discussed as a group and came into some understanding. It is very important at this point to note how the discussion shifted from me presenting my views to the participants, to us sharing together our understanding.

Quite a number of issues emerged in the process of discussion. These included; the identification of the concepts of vocational pedagogy to apply in the innovation that would lead to the improvement in practice, we also made analysis of the possibilities in which the innovation would conflict with the existing school systems and the possibilities of working with high numbers of students. The teachers also expressed concern over student’s ability to make personal decisions on the learning process and how the student activities in projects were to be financed. These were all worrying issues.

We (participating teachers) developed the thinking that the inclusion of practical learning, innovative learning or competence based learning, the incorporation of dialogue and active participation by the students in the learning process would be good concepts to work with. We also recognised that major conflict would arise on the assessment process, because the existing

system emphasises on the use of tests to measure student's intelligence and achievement in the learning process. Never the less, we resolved to work through integration approach.

Through this kind of discussions, we were able to generate values to work with in the process of implementing the innovation. These values included; learning about project based learning approach by doing it, gaining better understanding of practice situations to be able to develop other strategies for improvement and having hands on learning for students. At this point, there was positive environment as the teachers argued that project based approach was possible through continuous review of progress as we got involved in the process of implementing it.

We (the teachers) agreed to hold regular meetings to discuss the progress of the research. Scheduling of the meetings to suit every participating teacher was quite difficult due to the varying teaching timetables and the days when the particular teachers were present at the school. To address this challenge, we set up some kind of guidelines to facilitate our activities, this included; making use of the voice recorder to record the discussions, which could be borrowed by any teacher absent during the discussions so that he can make follow up of the issues discussed; all the meetings conducted were to last for two hours; the meetings were to be held twice every week (Tuesdays & Thursdays) starting at 16:30 and meetings were to be conducted in the presence of three thirds of the members.

The attention then shifted to the other important participants (the students of senior three), who were fifty six in number. With the help of other participating teachers, I organised several workshops with the students. This was aimed at having their input in the innovation. In fact, all would not be possible if they had given a deaf ear and indeed, no success would have been realised if the students did not learn to own and work with the innovation.

Students were anxious to hear from me, not because they had seen the person who had been lost from them, but the content in a person who has been in Europe, which could have been possibly my experiences abroad or anything new that I had organised for them. But without biasing the whole process, students got surprised when I told them to discuss their understanding of the existing approaches that were being used in the learning process at the school. This was then discussed by the students at general classroom level, where they came up with both the strengths, weaknesses and the implications of such approaches of learning to their future life.

Students argued that the learning approach that they were using at the time was not favouring them because the teachers were so fast in the teaching-learning process; some of the teachers were unapproachable, to the extent that they (students) could fear asking questions and that there was no emphasis being given to practical learning. However, they appreciated the method (lecture approach) in terms of quick syllabus coverage and having uniformly organised notes.

I was quite impressed by this strategy as the students themselves realised the negative side of the chalk and talk approach that was being used by the teachers in the teaching learning process. I also challenged them to discuss the possible ways of improvement to meet their learning needs. By so doing, I realised that the implementation of the new innovation was going to be easy, because when students got involved in making suggestions on the possibilities for improvement, they learnt to own the innovation and this therefore would make them responsible for whatever actions they would take while working with the innovation.

To ease the whole process, there was a suggestion by the students to form the working groups, an idea that was supported by all the participants. Student's discussion groups were then formed by use of random approach; say A, B, C, and D. The students were seated in lines (in the classroom), so I would move touching on every ones head as I counted abcd repeatedly. So those who fell on "a" gathered together to make group A, and in the same way, other groups were also formed. We came up with four groups each with fourteen students.

The choice of the group leaders was left to individual groups which they did democratically by show of hands. Any other action taken in a group was incumbent upon the members of that group, but the decisions were often documented and then an action taken to have the facilitating teachers informed. Students suggested electing one student as the overall leader of the class. Individuals were nominated and by show of hands, one student was voted in. His role was to coordinate with the various group leaders on the use of resources, collaborate with the various group leaders in deciding on the days/dates/time to have general class presentations and he would act as a linkage between the students and the teachers.

Different group leaders took charge of organising group activities. Students made group rules to guide group performance. Most common in all the groups was equal participation by all the members of the group, respect for each other, time management and good cooperation. Most

reported challenges in the groups were; absenteeism by some members, selfishness by some students (refusing to share some experiences with the rest) and segregation by some members (formation of clicks within the main group), where some members feel they know more than others.

I do appreciate the process of how the groups were formed as it instilled the aspect of democracy in the students. It also ensured that no interest groups were formed. But as time went on, one group (C) through their group log recommended the formation of the groups on friendship basis. The major reason given was that some members of the group were not cooperative. Some questions lingered in my mind at that time; would it be a good idea to have friends alone in groups? Will this result to better learning? Would it make group members free on expressions?

I presented the idea to the whole research team. After some period of deliberations, both groups realised that it would not be possible because some learners may not necessarily have friends to team up with. Secondly, there was need to socialise in the learning process. As we the teachers embarked on counselling the students, there was positive change of attitude as the students learnt to respect each other, work with group rules and slowly developed good esteem towards the learning approach. Never the less, these were part of the challenges students had to deal with.

Students took charge of their project activities. With the help of the facilitating teachers, students went through the process of project identification, where the driving question with defined tasks to answer the question was formulated. To make it easy for the students, I printed out copies of the project proposal form, which the facilitating teachers distributed to the different groups.

Table.3.1. Project proposal form (*The idea was extracted from Scott, 2005:36*)

Project title	
Topic to be researched on (Driving Question)	
Basic skills to be answered (Forms the Objectives)	
Benefits of the project related to life outside school (Relevancy)	

It was important for the students to support the choice of the selected project with reasons because this helped me to reflect on what they value most in the society (society needs).

Chowdary et al, (2004) recognised the need for the identified projects to be educationally valuable, challenging, adapted to the abilities and the interests of the students, making use of the locally available materials and the project tasks being achievable within a given period of time. Notable concerns during this process were on the projects identified outside the curriculum and the sustainability of certain projects.

Students came up with the following ideas; the project title was Piggery. The major driving question for the project activities was *“How are pigs reared and managed?”* The skills in question were to be answered by students undergoing the actual process of rearing the pigs. By so doing, they would encounter some challenges and then search for applicable solutions. This provides the answers to the question in diversity, but generally, the major tasks involved;

- Pig breeding.
- Pig housing and Equipment.
- Pig Nutrition.
- Pig health management.
- Pig record keeping.

Since we were using integration approach, where the innovation was to be integrated within the existing school systems, the selection of the projects by the students had to be done within the existing curriculum. This was also done in relation to student’s aspirations in the society, the broad aims of education and the purpose of the innovation. Though I learnt that some curriculum topics could not be facilitated through project based approach, students also suggested project tasks outside the curriculum and this questions the relevancy of the curriculum to the learners.

Students performed project tasks in groups while making weekly learning logs¹⁰ for discussion. They were integrating past experiences with actual tasks on the ground, while at the same time relating to the theories in textbooks. I and other participating teachers played the facilitation role, giving help to groups that would request for help, as well as being learners in the process. We made observations on students performing project tasks, attended student’s discussions, reading student’s logs and giving timely feed back to student’s work.

¹⁰ Learning Log is a record made by the students indicating the activities done, the experiences met out of doing an activity and the lessons learnt from undertaking such activities.

However, some groups would prefer to have the teacher with them most of the time. It seems they were not so confident with themselves and it may also be related to the effect of the previous approaches in which the teacher is seen to be the supreme source of knowledge. Other groups preferred to push on with the learning process by themselves.

The completion of each project task culminated into a written report, which was documented and presented to the whole class in a workshop. This was to dialogue on the major learning points to create knowledge. Through these workshops, all participants were free to ask questions, which were further reflected upon at individual or group level.

This was the kind of the working environment that existed throughout the Study. I made use of personal journal to jot down ideas which could trickle in my head depending on the situation. This was backed by physical observations, recordings and photography. At the end of every two weeks, I would come up with a detailed log, reflecting on the experiences met. This would help me think back on the activities done, making reviews on what worked and what did not work, so as to make plans with colleagues on alternative actions to undertake.

Towards the end of the process of data collection we (teachers) organised a general workshop in which the different stake holders within the school were invited. Students made presentations. Certificates of recognition were awarded to various students who played the major role towards the success of the innovation. I was also recognised by the school board of governors for initiating the innovation. It was generally a day of learning mixed with fun.

The evaluation of the Study was done in line with the achievement of the set research objectives. It was aimed at generating information for the areas that needed more emphasis within the innovation, so as to ensure its continuity in a rather rewarding way. It was done by both the students and the teachers using various approaches. (*See details of the evaluation in page 71*).

As mentioned in figure 3.1, we (the teachers) would collect the data on every action taken in the research process on individual basis, interpret it and together as a group we would share our experiences in dialogue meetings. New ideas for action were based on team consensus and so nobody was solely responsible or accountable for whatever mistakes were made. The sense of involvement, observations, record keeping, dialogue, democracy and reflections were all important in the process of working with the innovation.

3.4 Data collection tools

Data collection is a means to generate the needed information for discussion and reflections. Therefore proper selection of the data collection tools is necessary to enable the collection of the right data for interpretation. In accordance with the research design, and the objectives, I made use of the following methods to collect the needed information.

- **Interviews:**

“One possible way of testing our knowledge of the situation we want to improve and develop is to obtain additional information” (Altrichter et al, 2008). I conducted oral interviews with the students and the teachers at the beginning of the research and at the end of the process of data collection. The first interview was geared towards updating my thinking about the issues surrounding the area of research, while the other interviews were for evaluation purposes.

The questions were semi-structured; followed an interview schedule with predetermined questions but more flexible. Norton, (2009) acknowledges the significance of semi structured interviews because they allow the interviewer to use probes designed to elicit further information when necessary. Through these kinds of semi-structured interviews, it was possible for me to make clarification on questions not understood by the respondents.

It was very difficult for me to listen actively while doing the interview, so I opted to have them recorded for further analysis. The other challenge was that some students feared to bring up the negative part of the innovation during the interview process. I began to think that possibly another teacher should have done the interviewing of the learners, but all in all, I had to play around with the questions. Sometimes, I had to use questions that were not so direct to ensure that I get the right information.

Through the interviews, students gave their opinion about the existing teaching-learning approaches that were being used in the learning process. They noted that in most cases they were passive in the learning process, a lot of notes were given by the teachers than the explanations and they did not have practical sessions, giving an example of the teacher who had previously taught them about castration of the animals using the burdizzo, yet they have no idea of how the burdizzo looks like.

The students gave their views on what they thought would be the better way to satisfy their learning demands in relation to their aspirations. Most notable was the use of seminars, group discussions, having more practical lessons and setting up projects within the school where they would learn by doing. This gave me the starting point and a good foundation for the introduction and implementation of project based learning.

The teachers gave their views as to why the traditional approaches of teaching and learning have persisted, which they attributed majorly to the nature and the demands of the existing student's summative mode of assessment. Seemly, there was general consensus that the existing traditional approaches posed a threat to the future of education and the society at large. They then developed the thinking that possibly project based learning, which they nick named as "hands on-minds on learning" as one alternative way of bridging the learning gaps. This information helped to guide in the implementation stage of the innovation.

At later stages of the research, other interviews deemed necessary for the evaluation purposes. Once again, I sought for the views of the students, teachers and other stake holders through one on one oral interview. Different individuals narrated their experiences on project based learning in relation to the learning out comes and the needs of the society. This helped to generate information as to whether the Study objectives were achieved or not, as well as highlighting the areas that needed some improvement.

- **Use of questions**

The questions in this context should not be mistaken to mean questionnaires or interview questions whatsoever, but the questions were in inform of a test or written examination. The students had to answer individually. The purpose was to help in the evaluation of the extent to which the learning took place at individual student level. The questions were in such a way that students show their understanding and reasoning on the applicability of the acquired knowledge and skills.

For example; *with reasons, what advice would you give to someone wishing to begin pig farming? Why do you think it is important to be able to recognise the signs of heat in pigs? Prevention of disease and parasite outbreak in a pig house is better than cure; explain how you would put this into practice on a farm? Why is flushing a good practice in pig production?*

This same kind of arrangement helped us the teachers in the generation of marks that were to be used in the grading of the learners at the end of the term as demanded by the school system, though this was not the major aim while working with project based learning approach.

- **Use of relevant literature**

Quite often, I referred to the relevant literature whenever I needed additional information regarding to the research area, for example relevant books, articles and journals. This in particular helped to keep track with different views about similar situations of the Study. Particular reference was quite often made to the Ugandan national curriculum and the Uganda national examinations teaching syllabus, which provided the basis for the integration of project based learning approach in the already existing systems.

- **Research journal /reflection Diary /note book.**

It was a good place to record notes from unstructured observations or descriptions of the context and conditions of the interview as put by Altrichter et al (2008). In this Journal, I jotted down short memos or ideas about the research issues. All the data obtained by participatory observations and by conversations, interviews with students, reflections, reactions to the issues raised by the participants, interpretations and insights were also noted in the Journal. Chowdary et al, (2004:265) referred to it (journal) as a mirror of the work a teacher does in the class, since it provides an avenue for writing the work done and the plan of work with the students.

Altrichter et al, (2008) argues that the use of journals in Action research should be looked at as a companion to the research process. This means that journals work hand in hand with other research methods. They pointed out that keeping research journals ensures that the data collection is not artificially separated from the reflections and analysis, or from our actions as practitioners, which also leads into continuous stream of mini Action research cycle. Ortrun, (2009) adds that without a journal, our reflection is often transitory and vanishes in a sub – conscious mind where it becomes part of our tacit knowledge. He concludes that a journal is itself a legitimate source of data and a qualitative research method.

- **Field observations**

The major focus was mainly on student's activities on project tasks. It offers reality for gauging student's competence on particular tasks on site. For example, the quality of the product relates to the quality of learning. Altrichter et al, (2008) recommends the use of an "eye for the whole situation" and a kind of intuitive "seeing" that is different from a carefully aimed "looking" while observing. This calls for critical reflections on what is being observed.

I would associate this to "active observation" which involves internalising what is happening in the given situation, making analysis of what the situation demands of me, and then making an insight into what would happen if things were done differently. I made general observation on the sequence of events, behaviour of the students in a given situation to establish their attitude towards such situations and also their ability to perform tasks which later helped in the assessment of their competences.

Norton, (2009) suggests that while carrying out observational research, there is need to decide on the kind of behaviour to observe, the person to carry out the observation and how the recording will be done. Norton's major argument lies in the fact that students tend to behave artificially in a way they would not necessarily behave if they were not being watched. This relates to what I had previously mentioned in relation to some learners hiding the negative side of the innovation.

It was a challenge to me; on some occasions, as seen from the student's logs, different groups had expressed concern over poor participation by some group members. To my dismay, whenever I could go and take part on student's group tasks, the story was different because students responded differently on their actions when I am with them. With time, I noticed that it was a problem of attitude and lack of self drive. So I identified these students for counselling sessions, pointing out reasons why participation was necessary for them.

- **Photography**

Photographs provide evidence for the work done. Photography in this case was necessary in supplementing observation notes since it brings true reflection of what exactly took place. It gives the readers of this document an opportunity to view events as they occurred and be in position to understand better on what transpired during data collection.

Fig.3.2. Picture of one of the pigs.



Fig.3.3. Students treating a piglet



Fig 3.4: Students & I in a group discussion.



Fig3.5: Student displaying his group work.



The pictures above show that it was a project dealing with pigs (fig.3.2). Students perform tasks to address the driving question in relation to their needs (fig.3.3). Different groups converge to discuss the results of an activity or the experiences met in the process of performing project tasks (fig.3.4), the final findings from the group are presented to the whole class as a way of sharing the experiences and reflecting together (fig.3.5). Pictures were taken depending on the situation of interest relevant to the Study.

- **Logs**

Logs were effective in the process of data collection for both students and teachers. Both categories of the participants took note of every activity, the experiences created by that specific activity and later reflected upon individually or in groups. Occasionally, dialogue meetings were convened to reconcile the notes. These kinds of dialogue meetings enabled us to assess the extent to which learning was taking place and keeping us in line with the research objectives, besides revealing areas of needed improvements.

The use of logs in data collection was effective because it gives details of the raw data, portraying the actual situation (how things happened). The challenge for students was in writing the reflection part as they kept confusing with the experience part. Sometimes they would write what they think would make their work attractive during general presentations. In this case, it's important that they are given time to make a narrative, guided by some probing questions.

Table.3.2. Log format used (an extract from my week 15 & 16 log, 18/10/2011)

Event	Experience	Reflections/ Remarks
Student's presentations on project activities-reports. The purpose was to help students reflect on their reports to bring about learning, and also for them to share their experiences in similar or different tasks.	Some groups had left out the "why" aspect in their discussion. For example why certain things are done as they did.	Without this "why" aspect, it is difficult for the students to reflect and realise the learning points. In this case routine activities may be performed or replicated just with the aim of getting them done without critical thinking. -This also necessitates continuous probing questions by the teachers as facilitators of learning.

- **Conversations**

Incidentally, I do not think it is possible to have an Action research without any form of conversation. I made use of this method especially to engage participants and other stake holders on the basis of one on one conversation, though sometimes I would engage a team of teachers during lunch hours in productive conversations. The method was quite rewarding as it provided some ideas and clues which I could reflect upon at later stages to give new insights to prevailing tasks at hand.

Though it created awareness on various issues surrounding the education in the country, teachers expressed the necessity to have the relevant officers to direct their concerns; otherwise it would be a waste of time to discuss issues not to be acted upon. But I think this was the starting point, and then the ideas can be documented for further dialogue with the various stakeholders. The other challenge that I encountered during the conversations was the lack of organisation, resulting into some teachers dominating the talking than others. Possibly, there should have been someone to moderate the discussions.

- **Recordings**

To make the best out of a conversation, it may be a very wise idea to record the conversation. The recording was done in dialogue meetings with the participants and during oral interviews. In this case, I made use of a voice recorder to capture major discussions. The reason being that in the process of conversing or even interviewing, it was difficult to listen, at the same time making deep analysis of what was being talked. Recordings therefore provided an avenue for critical examination of the issues at later stages of the day. It is worth noting that recordings do not stand in isolation but rather act as a backup for other methods of research. Every recording that I made was based on consent with the participants for ethical reasons.

3.5 Summary of chapter three

The first steps in the working process were geared towards building a common understanding with the participants and the creation of an enabling environment for the implementation of the innovation, by critically isolating and relating different issues surrounding the innovation so as to build a strong foundation. This was done through dialogue meetings and workshops with the different stake holders. I would call it phase one of the innovation.

The second phase represents the actualisation of project based learning activities as well as the research. I would call it the take off stage, which involved participants going into experiencing with the different activities while reflecting on them to bring about learning. This also provided an avenue for data collection through different methods.

The third phase, which I would call the evaluation stage, was for the general assessment of the outcomes of the innovation. This also involved looking at what had worked and what did not work and why? It also involved reflecting on the extent to which the research objectives were achieved.

CHAPTER FOUR: DISCUSSION ON THE EXPERIENCES

This chapter is all about the presentation of the results from the process of working with the innovation, the analysis and discussion of the learning process, as experienced in the Study in relation to the objectives and the already available literature.

“Research is more than collecting data; it’s also about making connections between data and understanding them” (Altrichter et al, 2008:28). From day one of the launch of the innovation (project based learning), expectations were high from the participants as well as the observers (the school administration) on how it would make a difference in the learning of Agriculture. Right from the beginning, this was a unique experience as it was all about participation.

How can I use project based learning to improve on both my practice and the learning outcomes of Agriculture students at secondary school level in terms of knowledge and skills? This was the problem statement that guided the research process. I was able to come up with a number of experiences while working with the teachers and the students in the introduction and implementation of project based learning. The experiences are explicitly discussed in this chapter. I looked through the data, related different situations to come up with the main themes. It’s all about critical engagement with the actions and the experiences in a reflective way.

4.1 Knowledge generation in project based learning

The immediate concern here is the need to understand how learning takes place through projects. The arguments made are based upon the experiences as evidenced in the data. The understanding of how learning happened in project based approach gives guidance on its suitability in the improvement of the learning outcomes of those involved (these could be students or teachers), especially in relation to Agriculture as the major centre of focus.

I begin by making a discussion on the relationship between “learning” and “knowledge”. I believe it’s the learning that leads to knowledge and possession of some kind of knowledge shows that learning took place. So what is learning? How does learning take place? Who owns the required knowledge?

According to (Farrant, 1980), learning could be looked as the process by which we acquire and retain knowledge, attitudes, understanding, skills and capabilities that cannot be attributed to inherited behaviour patterns or physical growth. This is not far from what was reported by Illeris,

(2007:03) that any process in living organisms that leads to permanent capacity change and is not solely due to biological maturation and ageing is learning. He (Illeris) understood learning as a process involving the interaction between the individual and his or her environment.

Kyriacou, (1997) and Michael et al, (2008) perceived learning as a change in the learner's behaviour which takes place as a result of being engaged in an educational experience. Michael et al, (2008) classified learning into; declarative knowledge (the "what" of a specific topic), procedural knowledge (deals with "how" to do certain things) and the psychomotor learning which deals with the ability to do things. Other authors (Mary James et al, 2007) looked at learning in three perspectives; that's behaviourist learning theory (focuses on change in behaviour), constructivist learning theory (focuses on mental models that a learner employs when responding to new problems and the social constructivist approach (looks as learning as an interaction in the social context).

The impression given by the above definitions imply that learning is as a result of interaction with the environment or objects to generate experiences, and the interaction process should lead to some kind of change in the person. Traditionally, in the school context, it's believed that teaching leads to learning by the students and the teacher possesses the needed knowledge. But now I am meant to understand that the needed knowledge is as a result of the learner's interaction with the environment, while the learner takes greater responsibility of his own learning, as the teacher plays the helping role.

Learning in project based approach majorly occurs through mistakes made by the learners in the process of executing activities in projects, which is enhanced through reflection and making connections between different factors. In this case, I may cite two important incidences; one was during the construction of a pigsty¹¹ where students did not make use of some tools to help determine the orientation of the building. The end result was seeing the building collapse and later on they learnt the art of ensuring that angles of the building should be perpendicular.

The second case was with the treatment of a sick piglet¹², where an over dose was used. The end result was the immediate death of the piglet. The students then learnt that when administering

¹¹ Pigsty is the house for the pigs.

¹² Piglet is a young pig.

treatment to pigs, the right medicine must be used, at the right dosage for the right age and weight of the pig. This is the kind of learning that is never forgettable.

Though Farrant (1980:120) preferred to call this kind of learning “trial and error”, I wouldn’t very much take this because it would then look hypothetical. In our case, students were working to answer the driving question but not experimenting with ideas to see if they work or not. His (Farrant) argument is based on the fact that through trial and error, experience is created. He adds that through this process, we tend to eliminate those activities that are unsuccessful and consolidate those that are successful.

Farrant concludes that the conscious rejection of the negative course and the acceptance of only the positive produce a robust type of learning with lasting qualities (pg. 120). In addition to this, I think better learning would occur if students make analysis of why certain things did not work as expected and the qualities that make the other acceptable. All in all, a mistake made is learning made. What matters is how we make use of these mistakes through reflections to bring about learning.

Sutton and Barto, (1998) had similar argument, though they preferred to call it reinforcement learning (learning what to do - how to map situations to actions so as to maximise a numerical reward signal). They maintain that the learner is not told what to do but instead is given the freedom to discover the actions that yield the most reward by trying them. That the learner must try out a variety of actions and progressively favour those actions that produce effective reward. The exploration process by the learner means doing things, the process of making choice means reflecting on things which leads to change in thinking and brings better understanding by the learners.

I realised that a mistake made in the process of doing an activity in project based learning is not failure in the learning, no matter whether it’s positive or negative result. I see it as an “eye opener” that allows the learner to reflect on the mistake to try things differently. I remember times when students wanted something out of an activity and got another result, which Illeris (2007:158) prefers to call “mislearning” (the learning that does not correspond to what was intended). But still, the consequence of mislearning leads to new understanding of the situation and thus learning.

Personally, I had to lose the first recorded data by deleting the information because I hadn't mastered using the voice recorder. I learnt to save the recordings in my computer first before tampering with them. When I reflect on this particular incident, the making of mistakes initiates the process of trying out something else in a different perspective.

Arvind, (2010:pg.12) asserted that an important aspect of learning is knowledge creation. This is where project based learning has a strong point because the final aspect is the sharing of the experiences (the pooling of views in diversity), which ends up in knowledge / theories. This introduces the concept of the learning classroom¹³ since members learn from each other and through interaction with project learning environment.

When students complete tasks in projects, they learn. Farrant, (1980) maintains that activity contributes to learning through the complex interaction it stimulates with the central nervous system. He (Farrant) adds that through activity, experience is more readily acquired, skills are more quickly learned and new learning is better understood. This is all learning by doing, where students refine their action within the task to create knowledge.

There is also a close relationship between the way learning takes place in project based learning approach and the experiential learning approach. The focus on experiential learning is to provide the students with primary experiences (Scott, 2005). Project based learning also does similar work by presenting real tasks for the learners to work with. For example, students got involved in tasks such as pig breeding, nutrition, health management and pig housing.

“Experience comes as a result of interacting with something” (Dewey, 2010). To him, it means doing something and later suffer the consequences of doing it. He adds that the end product of such interaction must bring change to ensure that the experience is complete. This is not far from the experiences in project based learning since the students experience through the mistakes they make while performing given tasks. The end result of their mistake ends up in change of their thinking, which is learning.

¹³ Learning classroom: I have used the concept in this research report to mean a situation where the learners in the classroom make learning part of their daily practice, through interaction with the resources within the environment and the interaction between the students themselves.

Let me briefly introduce some encounter, I recall in one of our dialogue meetings as facilitating teachers, the issue at hand was the shortage of text books for the students to facilitate their inquiry! One of the teachers brought in the idea that we the teachers first teach theoretically, and then allow the students to apply such theory on their project tasks. This was complemented by another teacher, as he noted that in the learning, theory comes first ahead of practice. His argument was that such past theoretical knowledge can be used to perform practical activities and the students would be in position to take note of the precautionary measures.

The implication of this school of thought is that, the taking of precautionary measures against risks would limit students from making mistakes, thus limiting their learning. Secondly, this is the same as telling students what to do in the process of learning, of which they will copy and replicate what the teacher said, but less learning will happen. The students may also end up repeating the theory and may not reflect on how such concepts can be used in daily encounters.

Thirdly, because it indirectly tells the students what to do in the projects, this removes the aspect of problem solving. Scott, (2005:11) adds that “even meaning and interest is lost if educators take charge and tell students what to do to complete the projects”. Though I agree with Scott, it’s important that students understand why they are doing what they are doing, even before they start doing it so as to bring purpose and later be able to reflect on them.

Farrant, (1980) argues that when memorisation as per this example, becomes the centre of focus in the learning, then the teaching becomes the process of training children to perform prescribed skills correctly without any real understanding of the purpose they serve. He referred this to a kind of education that may be thrown off by the learners like unwanted garment as soon as the students leave school. Dewey, (1938) as cited in Scott (2005) was of the same view as he noted that “if students do not understand why they are involved in the learning activities or rather do not reflect on experience, it may lead to none educative experience”.

What the teachers suggested, according to Scott are secondary¹⁴ experiences. For example, reading textbooks which can still be used in primary¹⁵ experiences. This would mean both

¹⁴ Secondary experiences are the experiences encountered as a result of reading books, watching videos.

¹⁵ Primary experiences are direct experiences which often require hands- on involvement (Scott, 2005:19).

primary and secondary experiences are necessary in project based learning. For example; a project task like care of the piglets would require students to read information of certain techniques of caring for the piglets and such information would complement the primary experiences especially if the students have to move from known to unknown. Primary experiences on the other hand would disproof or confirm some of the secondary information.

The immediate concern I see in this ideology of integrating both primary and secondary experiences on project tasks, which the facilitators need to be conscious about, is not to make the learning process to be in inform of hypothesis. I would advise that in project based learning, let the starting point be what is known to the learners rather than building on theories. This is supported by Michael et al, (2008:05) as they asserted that the process of building new knowledge by the learners starts with a foundation of everything that is already known by the learner.

“An ounce of experience is better than a ton of theory simply because it is only in experience that any theory has vital and verifiable significance” (Dewey, 2010:75). He adds that any kind of experience is capable of generating and carrying any amount of theory, but theory without experiences cannot be grasped even as theory. Scott (2005) also warns of this, as he asserts that the learning may come to a halt when experiences from the past are not projected into the future.

In project based learning, how well students engage in these experiences through reflection matters if productive learning has to happen. Scott, (2005) is of the view that we can only learn from experience if we reflect upon it after words. Students have to relate their experiences to real world and application to daily encounter. In simple terms, learning through project based approach also happens when students reflect on past experiences.

Illeris, (2007:65) recognises reflection as a form of learning which he named as “after thought” which is sparked off by interaction with the environment. He explains that reflection as a learning process can be characterised as an accommodative learning that does not occur immediately in connection with the trigger impulses, but after time lag. This is where the use of logs by the students becomes vital as the logs help to remind the students of the need to be conscious with their experiences while performing the learning tasks.

Project based learning is guided by a driving question. Students perform the activities in groups with the aim of addressing the question. It puts the students in the state of research and working to address the question. The process of making an inquiry into identified issues of concern is learning by itself. Planning, designing, and implementing new ideas require the students to use some kind of inquiry and thinking their way through the process (Scott, 2005). In the process of looking for the information, the students will learn how to learn and explore new ideas.

The use of an open driving question requiring some kind of thinking to create a response is a key attribute that makes project based learning an inquiry. The question I would ask is *what about the intellectually handicapped learners? How will they make use of this high order thinking to bring about learning?* Of course I can't rule out the individual differences in the learning. Some times in class, students are classified as poor performers and bright, but this is basically determined by the ability to answer specific questions on test / examinations which to a large extent I feel is not fair enough.

On many occasions while observing the students on hands-on project activities, I noticed some students who just stood without doing physical work. In student's logs, the major concern noted was poor participation of some members of the group. They reported that though their colleagues attend discussion groups, they rarely make their presence felt. I started to wonder if this category of the students was also learning. When we (teachers) gave an exam which was more practical in nature, aimed at assessing the extent to which individual learning took place, this group of students proved to have learnt basing on the kind of the reasoning they were presenting on paper.

I would imagine if it is possible to think that mere observation is learning by itself. The worry is that it's difficult to justify this kind of learning because it may go unnoticed if the learner doesn't express it outwardly. Farrant, (1980) on the other hand argues that activity is not enough because it's possible to be active yet learn nothing. Farrant calls for the sense of involvement while doing the activity rather than doing it aimlessly.

Though Dewey asserted that no experience holds meaning without some element of thought, I still feel that Dewey was concerned with the power of reflection. It's not possible for students to undergo through such experience without learning taking place, after all learning is the sum total

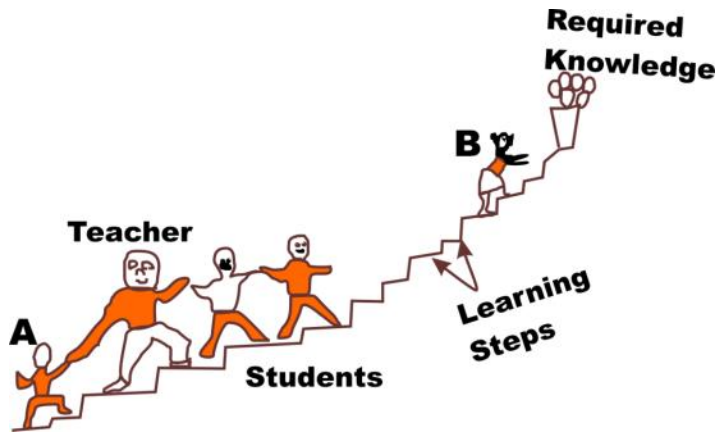
of what is known (Dewey, 2010). The issue of high order thinking concept neglects the hands on (psychomotor) learning.

The use of high order thinking in project based approach works in determining the extent to which the learning by the students took place. But if the objective is to have better leaning, then in my own opinion what is important at secondary school level is;

- To ensure that the activities selected / tasks by the students support learning through projects; because what I realised is that not all what was reflected in the curriculum could be handled through projects, unless other learner centred approaches are used in conjunction with the project based learning approach.
- To ensure that project tasks are meaningful. This then serves the purpose for the activity in relation to the future and needs of the society. It also keeps the students motivated and interested in the learning process, as they work to ensure that their objectives are met.
- The teachers need to play an active role as facilitators, being present when needed and giving feedback. Teachers need to keep motivating their learners by reinforcing on their abilities, and offering the opportunities for the students to try out their ideas.
- Teachers making sure that the opportunity for hands on activities are in the projects, so as to bring in hands on learning rather than so much focusing on cognitive abilities of the learners.
- The project tasks being in form of questions / inquiry so as to direct the learning process.

Students took charge of their learning in groups; the teachers were in most cases consulted by the learners whenever needed. Incidentally, some learning groups were victims of perpetual consultation, while other learning groups preferred to have minimal consultations with the teachers and made conclusions on their own regarding to the project tasks performed. While making this observation, I noticed two other forms of learner centred approaches embedded in project based learning approach.

Fig.4.1 Illustration on step by step learning process



In the illustration above, “A” represents low achieving learner, commonly referred to as slow learner, while “B” represents an achieving student, commonly referred to as a fast learner.

The illustration in fig.4.1 above is a representation of those learners who opted to have regular consultation with the teachers (facilitators). Probably one could say because they were not familiar with the innovation but my interaction with them revealed that they were not confident with themselves. To help them reach their desired knowledge, I, along with other teachers decided to prepare for them small learning steps so that we could climb with them.

These learning steps in this case involved building group capacity through formulation of group rules and some dynamics on time management since each day was congested with several subjects to be learned. These learners were then able to climb the same hill which had proved difficult for them. There was need to motivate them to try climbing the same hill and the understanding of why it was necessary to reach the top of the hill.

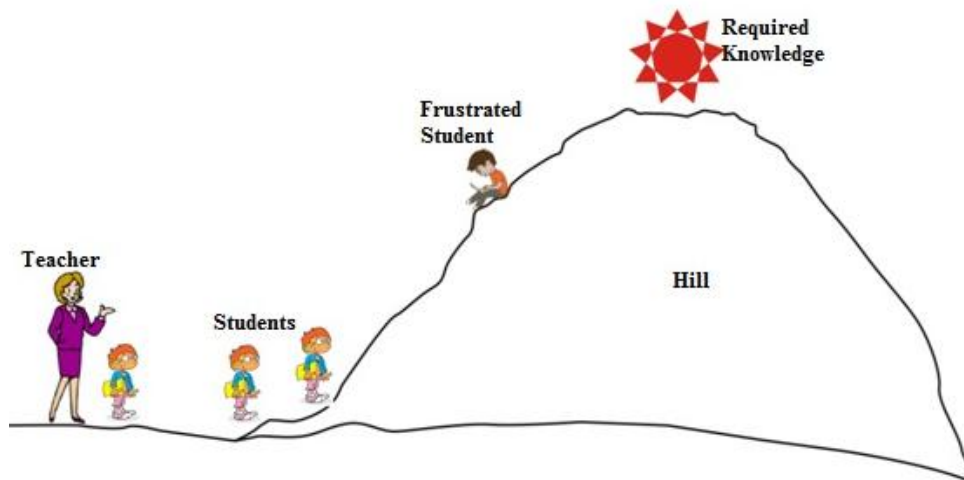
Because of this close collaboration between the teachers and the learners, it helped in the assessment of the group at every step made. It ensured good supervision of the learning process and brought the learners and the teachers closer. In this way, we the teachers were able to understand our students well and the challenges they faced in the learning process. In the same kind of working atmosphere, the students learnt to make smaller steps for themselves whenever need arises, taking into consideration the past experiences (knowledge & skills) gained on the previous attempts to climb the same hill.

The learners then reached the top to get the needed knowledge by themselves. They were satisfied because they managed to access the needed knowledge. I presume they will be in position to climb similar hills, meaning that they will be in position to make use of the same knowledge to apply in similar conditions.

In my own opinion, I would call this step by step learning or guided learning. The role of the teacher is very clear; he is the facilitator of the learning process. More emphasis is placed on the process where learners will be able to obtain skills, which they can apply in obtaining other required skills and knowledge.

The second illustration below represents those students who opted to avoid teachers as much as possible in their group tasks in the process of learning through project based approach.

Fig.4.2 Illustration on students who preferred trying things by themselves



These students preferred to try out activities by themselves, with minimal effort from us the teachers. My contribution as a teacher was to provide what the students needed and encouraged them to keep moving. But of course, I kept on observing them go, while making some notes on my research journal on how they were moving. I was also interested in the learning process and their experiences for discussion.

To my dismay, there was no uniformity in their progress as some group members looked to be more informed than others. There was a sign of frustration as some of the group members resorted to complains and requesting to join other learning groups. I understood this as failure to

climb the hill. I also noticed this through looking at their logs and weekly learning reports presented for discussion, which showed an increase in number by some groups.

Though ideally it may seem like each student would enjoy the benefit of learning according to his or her pace and abilities, it made the organisation of the group activities especially the group discussions difficult since not all the students were at the same pace with the rest of the group members. The other problem with it is that the process takes long, because they have to keep experimenting with the different options to answer the questions. I think this is the major reason why some of the learners equated project based learning to be time demanding.

When I critically analyse the two scenarios of learning encountered during my Action research with project based learning, I am poised to believe that the first approach (moving with learners step by step in the learning), which is represented by the first illustration in figure 4.1 would be more appropriate. I have quite several reasons to believe this as evidenced by the data collected and my own experience, having worked with both of them.

While looking at the student's project reports and the exams done by the students, there is evidence that some important skills were missed out by some students, possibly because some of the learners worked aimlessly in their project activities. Reflecting on this, I would prefer that the students begin with dialogue to identify the skills to be learnt and then working in focus to acquire them (working along the objectives).

The role of the teacher at this moment becomes vital as he needs to have that "critical eye" to study student's learning. He needs to facilitate the learning by asking provocative questions to awaken student's curiosity in the process of learning. Another imminent example I can point out in relation to this is when the students listed the major tasks to be accomplished in the projects (piggery), but didn't mention of the pigsty, yet this is one of the starting points in such a project, but I owe them an excuse for this because they might have been used to traditional Agriculture, where pigs do not necessarily need a house to live in.

Moving step by step in the learning process involves the students making regular mini presentations, which they perfectly did. This helped us (the teachers) to assess how learning was taking place, helped to discover the areas of weakness, few of the learners could be left behind and generally by no means it was easy for the learners to determine the next course of action in

the tasks. It also ensured that on regular basis, the students reflect on what was learned, what worked, and what didn't and so they were in position to strategise on the next move.

Some students had the feeling that project based approach was time wasting activity, though it has good learning outcomes. Truly if not carefully planned and handled, much of the time is wasted. This is the other reason why I feel that the teachers need to evaluate step by step as it would save time since it minimises scenarios where some students get lost in the quest for knowledge. It also ensures team learning but the teachers as facilitators, need to guard against driving the learning process by the students.

My agitation for step by step learning shouldn't be confused with guided discovery where the teacher sets the stage for the learning by providing all the materials which help the child in his search for the truth (Farrant, 1980). It is quite different as applied in project based approach, because students drive the learning though the teacher moves along with them but for the purpose of facilitation and being a learner in the process. As an attribute of good teaching, "teachers need to come out of their ivory tower and be as close as possible with the students" (Chowdary et al, 2004:39)

Where as I do advocate for step by step learning, it should not be mistaken with programmed learning, where the materials to be learned are arranged in a series of small steps designed to lead a learner through self instruction from what he knows to the unknown of new and complex knowledge (Chowdary et al, 2004). Mean while the concept as used in project based approach retains the students as the managers of their learning; the aim is the sharing of the experiences at every step and ensuring uniformity in group learning.

Through step by step process of learning in project based approach, I as a facilitator will be in position to ensure that learners provide each other in a group with the right knowledge. Farrant, (1980:117) argues that practicing what is wrong leads to fixing more the error. It's because of this reason that he recommends teachers to be on alert to spot errors in the child's work. Teachers can do this through regular follow up of the student's activities and supervision. The teacher may not directly tell the learner that she has made an error, but through probing questioning, the teacher can create awareness on the student about the error.

In relation to this, during one of our lunch time conversations with fellow teachers about education issues, one of the teachers of entrepreneur studies gave a testimony of the injustice he practices in his classroom while teaching. The teacher narrated;

“The examiners mark old things as correct, they are not aware of the changes! Those days, when making a public limited company, at least seven individuals were needed, but now it’s only two persons needed. The examiners are still marking seven persons.

The question followed from one of the teachers: “for you in the process of teaching, what do you tell your students?” The response was...I tell them seven because if I say two, they will fail the exams. This was laughable as the teacher confessed telling students wrong information.

This is what one of the teachers referred to as “intellectual dishonesty”, because the teacher knows the error but goes on to allow the students to perfect it in their heads. The dilemma is that the students will assume some offices after school where they will continue to practice what is wrong. I think the teacher in his teaching should make this clear to the students.

I do appreciate my students who very much believed in themselves and felt inspired to explore their abilities in project based learning as represented in figure 4.2. However I must report that the use of this approach depends on the environment (the system one is immersed in) and the nature of the learners I am working with. It calls for students to be self driven to learn and creative enough. Some of my learners opted to be passive, and waiting to read reports from groups. Some tasks not being done in time, all this leads to frustration by the learners.

4.2 Project based learning in relation to other learning approaches in Agriculture

Before and during the process of research, the major worry remained on how much project based learning would deviate from other learning approaches known to the teachers and the learners. Findings reveal that project based learning doesn’t so much deviate from other teaching / learning approaches (with the exception of the lecture approach). The project based approach puts the learners at the centre of their learning, while the teachers play the facilitation role.

Having gone through the experience of using the method while facilitating the learning of Agriculture students, I noted some areas of success and failure by the students and us (the facilitators). While reflecting on them, I came up with four issues that I think are important for

any teacher who plans to adopt project based approach to facilitate the learning of students. At the start of the whole learning process, the teacher needs to ask himself;

- Where are my learners in terms of knowledge (Experience known to them)?
- Where are they going (interest, aspirations, and the needs)?
- How are they going to get there (the process)?
- How will I know when they have reached there (Assessment tools)?

Some of these issues are reflected in the project identification form. It's important for the teacher to have an idea of the starting point and foresee the end result of the actions taken by the learners. It's important to move from known to unknown in the process of learning. The teacher getting to know where his learner's interests lie will help him to facilitate their learning objectively.

When it comes to the process, it's also important for the teacher to make consideration of the time available for the students to get involved in the learning activities and of the nature of the activities selected by the learners, citing an example where we were working within the school systems with congested curriculum, with many subjects to be learned each day. The nature of the activities give clues on the resources that may be needed, like the protective clothes; citing incidences when learners feared getting dirty while performing project tasks.

Though the students have the privilege to choose, plan and implement project tasks, it's important that these tasks are within the abilities of the learners (citing incidences when some of the students got frustrated). In simple words, the tasks should be achievable, realistic and measurable (especially when it comes to the aspect of the assessment of the objectives and the extent to which the learning took place. There should be some indicators of learning.

4.3 How project based learning improves the learning outcomes of those involved

Scott, (2005:12) looked at projects as things students create, build or produce by themselves. According to him, the idea behind project based learning is to put the students at the centre of the learning process, taking an active role through creating, presenting and discussing ideas. Gardner, (1991) as cited in Scott (2005) adds that projects are meaningful since they demand students to think, plan and make use of their own creativity.

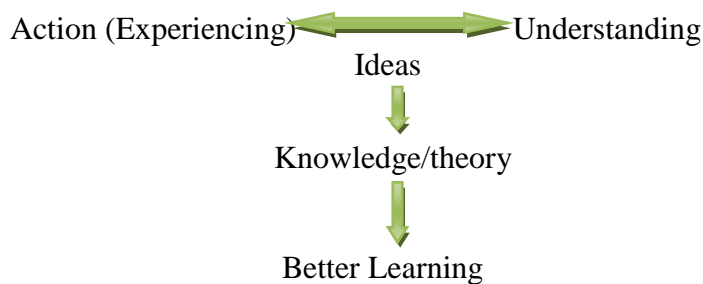
Project based learning represents learning by doing, within which experiential learning is embedded in. In fact, it is a collection of various methods like discussion, inquiry, discovery, and demonstrations. It is an approach of teaching and learning in which learning is organised around projects. These tasks have an outward relationship to the tasks that make up the current and the future demands of work.

When the learners are able to relate what they do in the projects to the real life situations, it brings purpose (meaning) to the learning process. An example in relation to this was during the identification of the projects by the learners to work with; they had to relate the relevance of the identified projects to the life outside the school. Students got motivated to learn, they became active and this improves the learning outcomes, compared to the previous approach where they were passive in the learning process.

Based upon the student's logs, discussion, project reports and my own observations, I came to realise that the ideas that may work in theory do not necessarily work in practice. The reflection was that theoretical writings need to be based the on context (situation). When students tried to apply some of the theories in the textbooks, they could not work in practice. For example, most text books recommend the idea of having some kind of ponds within the pigsty, but if not well managed, it may act as a breeding site for some pathogens as the water in it gets dirty.

In relation to the above, the illustration below presents a summary of how project based learning improves on the learning out comes.

Fig.4.3 Illustration on the interactive process in project based learning approach



The illustration in fig.4.3 reveals that there is a symbiotic relationship between understanding and action. Better understanding by the students as a result of interacting with different ideas brings better action, mean while the action taken brings better understanding of the situation one

could be involved in. The consequence of this interaction leads to the application of the newly acquired knowledge in relatively similar or completely new encounters. The end product is better learning outcomes.

Critical analysis of the above illustration presents an understanding of the mutual relationship between learning and knowledge. Undertaking an action means experiencing. Arvind, (2010:25) recognises this relationship as he notes that learning and knowledge are interlinked. He argues that when one learns, he or she gains the knowledge, and the conclusion is that knowledge is not possible without learning.

This is not far from what was reported by Kolb, (1984), as cited by Arvind, (2010:11) that “learning is the process whereby knowledge is created through the transformation of experience.” Kolb in this case recognised learning as a four stage process of doing, observing, thinking and planning.

Working with projects gives freedom to the students to experiment their ideas, then later reflect on their own to identify the skills learnt. By no means, this leads to mature reasoning, problem solving skills and ownership of the knowledge by the students, which is associated with lifelong learning. It may also lead to long term retention of the information learned.

4.4 Emerging issues on project based learning approach.

Being an innovation under implementation for the first time in a totally unique environment, unique in such a way that the student’s population is very high, the teachers are seen as the major determinants of student’s learning, passing with good grades in exams is considered priority, with highly structured curriculum; quite a number of issues emerged, amongst them included;

(a) In relation to the assessment process of learning by the students.

The existing mode of assessment in the traditional lecture method is by written exams, in which both the teacher’s and the student’s productivity in the learning process is determined. To a larger extent, this may be unfair to both the students and the teachers because whatever happens in the school setting for both the teachers and the students is more and cannot be determined by performance in examinations.

Project based learning in Agriculture requires a form of assessment that goes hand in hand with its structure. The assessment needs to be directed towards ascertaining whether learning by the students took place or not, and also making an evaluation of the kind of learning that took place. In order to achieve this, the assessment needs to be done at both group and individual level.

The basis for the assessment which I used and which I can recommend for the future users of project based learning approach in the teaching and learning of Agriculture was based on;

- The quality of the product produced (looking at how the product relates to the learning).
- The quality of the project reports presented by the learners, (looking at whether it answered the driving question, objectives, ensuring that adequate thinking, reasoning and problem solving abilities are explicit).
- The ability of the learners to show independent understanding of the content (done through test questions which needed practical reasoning).

Emphasis was placed on student's ability to use the information in performing project tasks rather than tests scores. Scott, (2005) warns that when application and problem solving are left out of the learning process, students quickly forget the information. He is of the view that problem solving requires thinking and thinking requires work, and when one applies the information to solve the problems, he or she is more apt to retain such information.

Experiential educators support performance based assessment, because they view knowledge as the ability to apply information, which often requires using life skills such as communication, cooperation, risk taking and problem solving (Scott, 2005). This is only brilliant if all the educators learn to embrace the approach, but in the system where the facilitators of learning are required to rank the students, then there will be no choice besides using the tests.

The ability to apply the information also comes along with its own implications, because it means that whoever has managed to apply the information (knowledge) has learnt, no matter of the quality! But when the aspect of quality is brought in the assessment, differences in the student's work appear, and this takes back the whole process of the assessment to standards.

Though we (teachers) had agreed that the application of knowledge by the learners forms the base line for the assessment, when the students presented their work, the work by other groups

looked more attractive and so it was difficult to resist making comparisons. This provoked participants to make own judgments. But this is quite negligible since mistakes were part of the learning process, which definitely reduced on the quality of the work done in project activities.

I would therefore advocate for a combination of both approaches because though standard tests advocate for memorisation, it's also true that one cannot apply the knowledge that he/she cannot memorise. When I reflect on this, I think possibly it's the nature of the questions to ask the learners in the test which need to be adjusted. There is need to set questions that engage the students in thinking, which I think will still reflect on the applicability of the theory. Dewey, (2010:110) seems to share the same idea as he perceived thinking as a method of intelligent learning, the learning that employs and rewards the mind.

The biggest weakness with standardised approach of evaluation is that if the questions are not well screened, it may live out many aspects of learning because some students may not be in position to remember dates of events, names, and places, yet they can apply or make use of the information. Scott, (2005) recommends the use of self-assessment tools that asks individual student what he or she learned from specific experience.

The use of standardised assessment tries to bring together the different learning by individual students together, to ensure that what is learnt is common to all of them. This is because all the students have to do the same questions, with specific marking guide to be followed by the teacher and with specific answers. This means that all students have to write the same answers, as if to mean that the experiences were the same for all the students in the learning process.

Through the oral interviews with some of the learners, I asked each of those I interviewed to give an account of his/her best moments in the project based learning approach, the knowledge and skills learnt. The data collected revealed that what is learnt depends on the individual student. So the conclusion is that the way each student experiences and constructs knowledge is different. This knowledge is then shared amongst the students in the process of group discussion and report writing since they had to reflect together.

The ability to apply knowledge demonstrates better understanding by the learners. Scott, (2005:69) reports that when the students apply information, they go through the process of constructing knowledge from own experiences. I must report that this approach of assessment

made my learners to work with a relaxed mind, knowing that it was not all about competition. Possibly this is the reason why some learning groups reported poor participation by other members or rather participated with minimal effort.

(b) In relation to the curriculum.

During the time of project identification, students suggested some of the projects of interest that were not part of the curriculum and others were far from the range within which the school could facilitate. This has a signal towards the relevancy of the curriculum, whether it meets the needs of the learner's vis-à-vis the society.

It could possibly mean that some of the content which the students were being given was not relevant. It conveys a message that in project based learning, the students need the freedom to experiment with their ideas and reflect on the skills learnt. They need the freedom to choose what to learn and how they should learn it, in the way that is meaningful to them.

Good enough, most of the projects selected by the learners were within the curriculum. While making analysis of the projects identified by the students in relation to why they chose them, it reminded me of the relevancy of my practice to the needs of the society. Students made it clear that at the end of their life at secondary school level while studying Agriculture;

- They should be able to produce food.
- They should be able to generate income through engaging in Agricultural projects.
- They should be able to create innovative ideas on Agriculture.

The tickling question at this point was how to make the learning of Agriculture through project based learning approach more relevant to the students, to address their needs and the needs of the society.

The nature of the curriculum organisation did not only limit our freedom in project based learning but it has a threat to the sustainability of the approach. I foresee it making project tasks to be seen as repeated sequence of activities each year. Ugandan secondary school curriculum is specific in terms of the content. With what to be learned for each class level already predetermined, it means that students have no option apart from choosing to work with project

tasks from within the curriculum. Yet every year, we receive new students, who then have to repeat doing similar kind of projects.

I am not totally against this, since the new students may possibly experience differently but the society needs or even the needs of the students might have changed over time. Secondly, imagine me as a facilitator, who is permanent at the work place, it may look so boring to me to work with the new batch of the learners on similar projects, and possibly I may not realise any addition of knowledge to me.

(c) The aspect of participation in groups:

There was a general challenge of dealing with students who did not want to work in groups, yet academically these are capable students but prefer to learn on their own. Quite often, they preferred to observe, listen and make notes on what was happening. My interaction with these learners indicated that they actually learnt a lot through their active listening. But this kind of learning is difficult to know unless it manifests itself externally, through their ability to make use of what was listened in practical situations.

Active participation on the other hand may not mean total learning. Some learners had relaxed attitude towards active participation in the innovation, this possibly could have been due to a combination of various factors such as;

- The innovation being new, it could not pick up at a fast rate, so this slow response was expected.
- The deeply rooted traditional system, which empowers the teacher in the learning process than the students. So to the students, it looked something strange, they lacked self confidence and therefore were not self driven to learn.
- The issue of English as a language of communication in the discussion groups. It was a limiting factor. Some learners do not know how to express themselves in English, so they would feel out of place as their colleagues at times laugh at them.
- Project based learning goes hand in hand with creativity. My role as a facilitator was to develop the instructions that enhance creativity amongst the learners. Because they would expect everyone to make contributions in the group discussion, the students who regularly had no ideas opted to shun away from the group discussions.

The teacher's role as a facilitator was indeed paramount. I found myself performing the counselling role with students. Once in a while, I would call the students reported by members of the respective groups as poor participants for one on one discussion, aimed at seeking their views on why they were not active in group activities. Some of the students said they already had experience in the activities which were being done in the projects, since they were rearing pigs in their respective homes. I think this is partly the reason why their reasoning in the exams done reflected a lot of learning by them. Others said they didn't have any reason and I think it was just the adolescence stage disturbing them. But of course it was important to use the language of acceptance (Gordon, 2003) while doing this additional role.

(d) Relating to time consumption:

Notably, project based learning approach appears to be time consuming and yet at the same time it is more time demanding, especially due to the prolonged discussions and the issues not being resolved quickly due to the democratic approach. With the school activities programmed each day, it was quite stressful to the students as some tasks couldn't be finished in time.

But always every experience came with something to learn. We learnt to manage time. All the activities had to be guided by the available time frame, and the students realised the need to break down the project tasks into smaller manageable units, which still gives back up for my agitation for step by step learning within project based approach.

(e) Relating to the control of the curriculum and the assessment of the learners:

Project based learning possess a threat to the loss of control over the existing curriculum and loss of control over the assessment of the students if not well managed. As students take charge of their learning, the idea of having fixed documented curriculum content may no longer work because the learning in this case is driven by the needs of the learners. It also demands that the teacher who is facilitating the learning of the students takes up the major role in the assessment of the learning rather than UNEB, which does not see how the students are applying or using the knowledge in the actual life situations.

Project based learning just proves expensive in terms of the resources. As students learn from the mistakes, some wastage occurs. It is also taxing to the teacher. I recall one incident where one

group of the learners requested to be provided with a pregnant sow which was difficult to get at the time. Their argument was that quite often they had experienced deaths of the piglets during birth, so it became an area of interest to them to learn how to manage a pregnant sow¹⁶.

4.5 The Action research process

The motivating factor in doing Action research lies in the will, the value and the commitment that a particular teacher may place in his or her work. A teacher is a very important factor in the learning of students because what he does in the facilitation of the learning process depends on his or her experience. What is evident is that most teachers try as much as possible to replicate and re-echo some of the past life experiences, encountered during their time as students or the experience of having taught for some time and bring them to the current classroom situations. This possibly explains why it's common for both the teachers and the students to say "experience is the best teacher".

Teachers make conversations on issues regarding their practice as educationist which results in new ideas being generated. This new thinking remains as ideas if not acted upon. The process of Action research creates an environment that permits working with these ideas in a reflective way. This leads to knowledge construction and re-improvement of the actions. Roger, (1961) as cited in Gail et al, (2001) concludes that the only learning which significantly influences behaviour is self discovery and self appropriated learning.

I understood Action research as a means for re-evaluating my knowledge and beliefs about teaching. It transformed my knowing into something meaningful thus improvement in practice. This transformation didn't happen without much reflection in action. Gail et al, (2001) adds that through reflection, the teachers and the students are provided with a frame work on which they can learn and grow.

Participating teachers lamented that through Action research, improvement in practice was possible. They were willing to learn as shown by their level of commitment. This had great influence on student's participation; seeing teachers learning with them added encouragement, because they realised that they were not alone in process of learning. Action research creates a

¹⁶ Sow is a female pig.

free environment that permits the participants to try risks in doing some things or experimenting with the different ideas, of course knowing that they would share the results and reflect together.

There is an imminent relationship between the Action research process and the process of Project based Learning approach. The process of conducting Action research and Project based learning are almost similar. Action research starts with the practical question, arising from every day professional practice of any nature, the data is collected, interpreted and reflected upon to ensure that relevant action is taken (Altrichter et al 2008).

This description of Action research represents it as an interactive process that integrates theory with practice through reflection and planning. This doesn't deviate from Project based learning approach; where the starting point is the driving question arising from student's interests or needs that they feel should be answered by the learning process, which puts the learners into the state of inquiry. They then reflect in the process to bring about learning.

One notable issue with teacher Action research is that it needs an environment where teachers are given the freedom to make decisions relating to the issues of concern (for example, in the curriculum or the teaching practices). In this case, its effectiveness can be seen. For instance, due to much time needed by the students to accomplish their project tasks, it would definitely mean that other curriculum topics would not be covered in time as per the requirement of the school system. Once the teachers have no privilege to make adjustments on the situation in question, then it may not be possible for them to achieve much of the needed improvement.

4.6 Summary of chapter four

Presented in this chapter was the understanding of how knowledge is generated in project based learning approach and how it may end up in better learning out comes by the students. It has shown that learning in project based approach happens through the sharing of ideas (experiences), making reflections on happenings, getting involved in doing tasks which enable the learners to relate theory to practice. It shows that much learning occurs as students consult different textbooks searching for relevant information to address the problems and not forgetting the learning that happens in the process of making mistakes. The process affords the learners the freedom for experimentation of ideas which develops the reasoning and problem solving abilities by the learners, where they will be able to own the knowledge.

CHAPTER FIVE: EVALUATION PROCESS OF THE RESEARCH

This chapter presents the analysis of how the research project was evaluated in order to understand the extent to which the research objectives were achieved. It was all about finding the success or the failure after implementing the innovation. Throughout the Study, the major focus was how I could use project based learning to improve on both my practice and the learning outcomes of Agriculture students at secondary school level in terms of knowledge and skills.

Before the implementation of the innovation, I had the anticipation that the introduction and implementation of project based learning, while applying the concepts of technical vocational pedagogy would result into improvement in my practice as a teacher of Agriculture. The improvement in practice would possibly mean change in the approach used in facilitating the learning process by the students to bring about better learning in terms of knowledge and skills.

During the evaluation process, emphasis was placed in understanding whether the modification of the learning approach served the purpose. I looked into deep analysis of the reasons why some learners may have been uncomfortable so that we (the teachers) can support them to learn better. The evaluation was done with both teachers and students. I also made personal evaluation based on personal reflections, making comparisons with how I previously conducted my practice.

5.1 The evaluation process with the students:

The aim was to know whether there was an improvement in the learning outcomes or rather to ascertain whether learning in terms of acquisition of knowledge and skills took place. This would give an idea whether the approach was effective for continued use to facilitate the learning by the students or not. This was done while reflecting on the previous teaching and learning approaches that were being used in the learning process. This evaluation in particular would answer the research objective two.

Chowdary et al, (2004) noted on the relationship between the teaching objectives, learning experiences (means) and evaluation (evidence of what is taught and learned). They perceived evaluation as a means by which the teacher in this case can use to determine the extent of achievement of the objectives, effectiveness of the approach used and the achievement of the goals by the learners. They emphasised the importance of the teacher knowing where his or her learners were at the beginning of the learning experiences (in terms of knowledge, skills, attitude

and goals). Taking note of these changes will enhance teacher's reflections on the improvements that might have taken place regarding the process of learning.

Quite a number of performance indicators were used by the participants to evaluate the effectiveness of the approach in meeting the research objective two. This particular aspect was assessed based upon;

- ***Student's ability to apply the information.*** Students in their respective groups formulate a driving question to guide the project tasks to be performed. To answer this question, members of the group would get involved in reading textbooks and other information sources. They would then discuss in a group on which way to go. They then apply their ideas through practice in groups. Teachers observed how learners were implementing certain agricultural concepts in project tasks.
- ***Looking at the quality of the work done in specific tasks in the projects.*** Most students struggled to impress and ensured that their work came out with a difference and this alone improves on the learning outcomes and made it more interesting, though the making of mistakes in the process of performing certain tasks affected the quality of the work done by the students, but all the same, this was learning.
- ***Through making observations of student's participation or seeing them in action.*** Making an observation on students not only helped me to see how they were performing group tasks but it also helped me to understand their areas of interest and attitudes regarding the whole process. I noticed that some students acted differently in the presence of the teachers (would try to be so much busy with the activities) and yet the very students did not act in the same way in the absence of the teachers.
- ***The quality of the project reports presented by the students in their respective groups.*** Some guidelines were agreed upon by all the participants on the characteristics which define a good quality report. We as participants agreed that a quality report presented by the respective groups for general classroom discussion should address certain concerns like;

- ~ Answering the driving questions that guided the project activities.
- ~ It should show the understanding of the learning process.
- ~ The report should also relate theory to practice.
- ~ Show some reasoning on why some things happened the way they happened.

The thinking at the time was that if the report answered the driving questions, it's possible that the activities done by the students met the learning objectives. If the report showed the understanding of the process, it's possible to think that the students mastered the learning process and will be in position to make use of the same concepts in related ventures (learnt how to learn). Some kind of reasoning is a manifestation of student's ability to relate theory to practice or practice to theory, though it has been difficult to state comprehensively what should come first between theory and practice. Possibly it may depend on the situations under which an individual is operating. Reasoning by the students is also a sign of deep understanding by the students, thus better learning.

There was much evidence from student's project reports that revealed better understanding by the learners in the process of learning as compared to the previous approaches of teaching and learning. One major observation that almost cut across all the group reports was the "why" aspect that was missing in the reports, but probing and questioning by both the teachers and the students during presentations helped to create awareness in the different groups. Students were then given time to go back and review their actions.

- *The evaluation based upon the oral interviews with some students selected randomly;* for each group, one of the participating teachers wrote all the names of the members in small papers, he folded the papers and tossed, and then I picked five of the papers to generate the names of the students for the interview. The aim was not to bias the selection. The interview involved the students narrating their best moments in the learning process, mentioning areas where they felt comfortable or uncomfortable and also giving their opinion about future improvements on the approach.

In the process of interviewing, I was able to establish how learning took place, student's reasons for and against project based learning approach. I was then able to recognise what worked and what did not work, and the achievements made as a result of working with the innovation. Below

is a sample of the oral interviews I conducted with the learners. I preferred to call them by letters (for example, student A,B,C etc) though I know them by their exact names, but since they are speaking on behalf of the other students, there is need to have them protected.

Interview with student A

Me: I feel I should have a recorded interview with you, will you be comfortable?

A: *Yes sir.*

Me: You as a group leader, is there any comment that you can make regarding the process of learning using project based approach?

A: *Yes sir; it's good because some of us have gained courage and we have already got skills and knowledge on how to manage those animals. I think if such topics come in exams, we are going to perform very well sir.*

Me: What makes you confident about performing well?

A: *Because we share ideas from each other; you ask where you don't know and your colleague corrects you very well.*

Me: Were there any difficulties that you encountered as a group leader?

A: *Yes; absenteeism of some members and disruptions by other students during discussions.*

Me: How did you deal with those difficulties?

A: *Absenteeism was difficult since people come from different homes.*

Interview with student B

Me: Are you comfortable having a recorded discussion with me?

B: *Yes sir.*

Me: What comment can you make about project based learning?

B: *Mmmh, what do you mean?*

Me: I mean, are you comfortable with it and why?

B: *Yes sir; because it has helped me to see the signs of heat on a pig and the signs of a pregnant sow, which I will never forget. I also see the project as a source of income.*

Me: Were there any challenges in the groups and how did you deal with them?

B: *Yes; poor participation by stubborn students, some of them were not respecting group leaders. We managed them by assigning each person with a task to perform, but these people should be penalised next time.*

Interview with student C

Me: What do you have to say about the learning process used in project based approach?

C: *We need to be serious next time with other projects, because some of us have benefited and some have not.*

Me: How did you know?

C: *Because some students were coming to me to ask about some questions.*

Me: what is your suggestion for such students?

C: *I think we need to put all unserious students in their own groups. In this case, they will develop interest if they see other groups doing the work.*

Me: Do you feel empowered with knowledge and skills?

C: *Yes; according to my skills, I can begin my own farm or even teach other people.*

Interview with student D

Me: Having been the overall coordinator of project based learning, what comment do you have to make regarding the approach?

D: *It has been good, because the way of interaction was democratic. But students did not respect me because of my small size.*

Me: What other challenges were there?

D: *Some members started shifting groups. They preferred to be with friends and being in active groups.*

Me: So what you are trying to say is that some groups were more active than others?

D: *Yes sir.*

Me: What created that?

D: *Like in my group, some members were shy; especially the girls, yet our group had more girls than boys.*

Me: How did you handle this matter because your group report was good?

D: *We worked more with those who were willing while others observed and listened.*

Me: Do you think those who just listened and observed have also learnt?

D: *The percentage of those who have not learnt is more than those who have learnt.*

Me: What makes you to think like that?

D: *Because I saw the way they were answering in exams was not pleasing and even they were complaining that those things are not examinable in the national exams. They still say they have not learnt.*

Me: What makes them to have that confidence?

D: *They don't know case study.*

Me: What about you?

D: *Me...I have learnt.*

Me: How did you learn and your colleagues did not yet you're in the same group?

D: *Most of them were just interested to come and gather in group work to write reports and they stop there, they could not think further to put down in their books. What they were doing is like you have given them something to do for you but not for our own good.*

Me: So what advise can you make for next projects?

D: *They are not just used to, but we need to practice more with other projects.*

Interview with student E

Me: What can you say about the organisation of learning in project based approach?

E: *This is real knowledge which we can use at home.*

Me: How did you use group rules?

E: *We had them but not so much respected because we were just students and we sometimes lacked confidence. They needed the teacher to be present.*

Students were free and sincere with the process; most of them acknowledging the skills acquired and narrated how the approach has far reaching effects beyond the school boundaries. That through project based learning; they have developed better understanding of how to use the acquired knowledge in the practice of farming in the society. That they feel empowered to take on total projects of the same nature at home, meaning that they are in position to create their own jobs and that the approach has also improved on their interpersonal and communication skills.

Learning groups looked big (14 students) and one would be tempted to question this size. We thought of the same but there were quite a number of factors that forced us to operate with those groups. The immediate one was that there were cases of absenteeism by the students of which the teachers had no control over; it's between the parent and his or her child at home. This meant

that some group activities on certain days would be performed by eight members of the group. So assuming the group size was to be reduced to seven students, the chances are that they would fail to raise the quorum for group discussions.

The other argument in support of the group size as already mention by the students in the interviews is the shyness amongst some learners to express themselves freely. Some of them lacked self esteem. The innovation being new to them, this was expected since they were not familiar, but with the continuous process of working with the learning approach, I think they will learn to work with it and smaller working groups will be formed.

The interview with the learners revealed challenges encountered in the groups, for instance poor participation, segregations, lack of respect for group leaders, absenteeism and shifting of some group members. This really was a challenge to meet as a facilitator of learning. Despite the existence of group rules, it remained a challenge to me to meet the varying needs of the learners. Schlemmer et al, (2008) suggested flexible grouping to meet the varying classroom needs. According to Schlemmer et al, this would mean grouping and regrouping students appropriately based on particular activities. For example, for one activity, students may be grouped by interest, another by intelligence. But I think this will lead to other students feeling inferior to others.

Interestingly, two of the students felt that their colleagues had not learnt. Their argument was that they lacked organised notes that would enable them get good grades in the national exams. This was not surprising to me since the students themselves were the drivers of their own learning as opposed to the previous approach where the teacher was at the centre of the learning process. It meant that much of the learning was through doing rather than just writing. But I can equate this kind of thinking to the impact that has been cemented by our examination oriented mode of learning (learning to pass exams).

By saying “even those things are not examinable” means that some students should have forgotten the objectives behind the selected project tasks. I would imagine the amount of hidden learning, or the many things learnt and the many problems solved by the students which may have not been prescribed in the curriculum, which neither the teachers nor the students are aware of (Illinois et al, 1971). Schlemmer et al, (2008) maintains that the effective application of self directed learning skills by the students is not a matter of fulfilment to the assignment

requirements to earn a grade, but the mastery of these work skills would significantly affect student’s lives beyond the school boundaries.

Possibly, the idea of task sheets (Schlemmer et al, 2008) could be one possible way to help students keep track of their learning. Schlemmer et al, recommends the use of “KWL” chart. It’s a three column chart that students fill out before and after they participate in a learning activity.

Table.5.1.Task sheet (An idea generated from Schlemmer et al, 2008:35)

K (what the student knows or thinks he knows)	W (what the student wants to know or wonders about)	L (what the student has learned)
1.	1.	1.
2.	2.	2.
3.	3.	3.

Table.5.1. above gives an idea of what would be a task sheet. According to Schlemmer et al, the “K” column is what the student knows or thinks he knows, the “W” column is what the student wants to know or what he wonders about and the “L” column is what the student has learned. I think the idea is important as it may keep the students focused and self evaluating in actions; it may also help the learners to make connections between what is known to them and the new experiences encountered in the learning process.

On the negative part of the approach, some of the interviewed learners gave views such as: the approach being more time demanding; it is more burdening to them because every time the process involved them in the research process and reading more books. I would not consider this to be a problem because this facilitated them to learn how to learn (Mary James et al, 2007:28). They lacked confidence in some of the conclusions they arrived at as students, and this still relates to the attitudes and the beliefs that it is the teacher who knows everything right. I think that students just need counselling to get the right piece of mind.

- *The use of test questions (exam) as part of the evaluation strategy.*

As reported by Mary James et al, (2007), asking questions either orally or in writing is crucial to the process of eliciting information about the learner's state of understanding. However, the phrasing of the questions also matters. According to Mary James et al, questions phrased simply to establish whether the learners know the correct answer have little value especially for formative purposes because according to them (Mary James et al) the learners can give the right answers for the wrong reason or wrong answers for very understandable reasons.

Regarding the test (exam) questions used in the evaluation process, they were basically practical questions which I extracted from the project tasks done by the students. The kind of questions used necessitated more reasoning on the part of the students. For example;

With reasons, what advice would you give to someone wishing to begin pig farming? Why do you think it is important to be able to recognise the signs of heat in pigs? Prevention of disease and parasite outbreak in a pig house is better than cure; explain how you would put this into practice on a farm? Why is flushing a good practice in pig production?

The answering of these questions was done by the learners on individual basis in a written form. It helped in gauging how the learning took place at individual level. Secondly, it helped in the grading of the students as demanded by the education system, where the students have to do a written exam for the grades to be reflected in the end of term report card¹⁷ to the parent. It's believed that this report card proves to the parent of his son/daughter having attended school.

But as seen from the interview, one student reported that his colleagues have the feeling that those kinds of questions are not examinable in the national exams, as if to mean that the focus was on passing the exams not to learn. I have no blame on my students but the system under which they have been brought up. Similar kind of questions could still be asked in the national exams but with different formulation. For example; *state the signs of heat in pigs! Define the term flushing.* No reasoning is needed apart from cramming and reproducing notes in exams.

¹⁷ Report card is a document given by the school to the student at the end of the semester/term to take to the parents showing general performance in the exams done.

5.2 The Evaluation process with the teachers:

I did this basically to know if truly there was an improvement in the way I facilitated the learning process by the students which forms part of my practice. This would answer objective one of the Study. Other teachers also assessed themselves basing on the same criteria.

The first step in this case was for us the teachers becoming sincere in making self assessment at individual level. We drafted some questions to guide at this level; “Identify the purpose of your job! Is your job in line with the purpose? Which key competences were of help to you in performing your job during this period of Study? During the innovation period, what job activities were you most satisfied with? In what areas would you like to have more support? What proposals do you make for the future concerning your job?”

It was all about being objective and realistic to one self in answering the questions above;

The purpose of my job as indicted in the appointment letter¹⁸ from the Uganda Education service commission is to facilitate the learning of Agriculture by the students which should end up with the production of lifelong learners. To achieve this purpose, it necessitates me to engage the students in practical learning; however, this was never the case with the previous approaches of teaching. During the study, some of the key competences that were of help to me in performing my job were leadership skills, counselling skills, and mastery of the subject content.

During this study period, I was much satisfied with the good teacher-student relationship and the practical involvement of the learners. I also felt good with the new experiences encountered while working with the students, but I would wish to develop more skills in facilitating group learning by students, need to be given more freedom while working with the students especially in curriculum areas, more support is needed in textbooks. I would propose the expansion of project based approach to include all the students in the department of agriculture in the school, make follow up to see how the students are connecting learning in the school to life in the society and then have dialogue with various stake holders on the possibilities for expansion at the national level.

¹⁸ Appointment letter as per the Ugandan context is a letter given to a person who is considered successful for the job; it indicates the job specifications and the remuneration.

The conclusion then was that, if the work done (facilitating the learning of students through project based approach) was in line with the purpose of the job as prescribed by the Education Service Commission, which involves equipping the learners with the necessary knowledge and skills to become lifelong learners through practical involvement in the learning process, then this meant that some improvement took place in my practice or the practice of that particular teacher, but of course this was enhanced by reflections on the way other teachers and I previously conducted the practice of teaching.

I also used my immediate supervisors (from school administration) and other teachers I worked with in the evaluation of my practice. These people were well informed of the emanating issues in the Ugandan education system and had some history on how I often conducted my practice. With this background, they were able to recognise some improvements in my practice in relation to how I previously did it. I had an interaction with one of the teachers who participated in the implementation of the innovation and this is what he had to say;

Me: I wanted to know your general submission regarding the innovation we have been working with, what do you have to say?

Teacher: *Generally I have liked the whole process because it has changed my mode of teaching, and even as a teacher, it has shaped my understanding because I now understand agriculture as skilled based subject which should end with results or product.*

Me: What interested you most?

Teacher: *There is self generation of knowledge by both the teachers and the students. It created a bond between the teachers and the learners.*

Me: when you assess yourself as a teacher, what areas do you feel strengthened?

Teacher: *In skill acquisition and I can now talk with confidence because I have evidence on the ground because I was able to see practically what was not written in the textbooks.*

Me: If you were given chance to assess me as a colleague, what are those areas in my work that you feel more satisfied with?

Teacher: *You have been a person who loves work, who loves others learn and work together. You have tried to bring the teachers, students and the community together. You have given us another methodology of learning and we are now looking at you as an icon in the learning.*

The evaluation process with the teachers also followed some kind of guidelines. We developed a form which we called “performance assessment form”. The whole idea is on the ability to identify areas of strength and weakness in practice through dialogue with other teachers, then thinking of the possible ways to improve on them.

Table.5.2. Performance assessment form

Competences	Output indicator	Self-assessment	Teacher’s own comments	Appraiser assessment	Appraiser comments
Teacher participation in student’s learning	Timely feedback, regular attendance of student discussions	e.g. good	e.g. Participated actively	e.g. excellent	e.g. teacher always available when needed by the students
Teacher-student relationship in the learning process	Increased participation of learners, level of motivation by students to learn.				
Resource improvisation/creativity	Observed local resources on ground				
Organisation of the teaching /learning process	Rightful application of methods,				
Assessment of student’s learning	Student’s logs, tests, task completion by student, student’s learning reports				
Professionalism & job knowledge	Observation of ethics, use of relevant experiences				
Leadership & decision making	Use of democracy, guidance of students in development of appropriate solutions, team work.				
Teacher mastery of content and ability to achieve the desired output	Integration of theory & practice, timely feedback, shares freely with others				

The assessor and me sit together to agree on what competences to be evaluated, we also agree on what would be the possible output indicator for the identified competences, for example, for the case of teacher participation in the learning process (output indicators are; timely feedback, regular attendance of student's discussions); leadership & decision making (output indicator could be the use of democracy, team work, dialogue meetings); professionalism & job knowledge (output indicator is observation of ethics, integration of theory & practice, timely feedback to the learners); Assessment skills (indicated by both teacher/student logs, student's learning reports).

Having been the person who worked with the identified competences while facilitating the learning process, I would then make individual assessment whether the identified competences were used well or not and give an explanation or comment. The assessor would also do the same. The end of the process culminates into dialogue between the teacher (me) and the assessor on the comments made. Through dialogue, the assessor and I would be in position to identify the areas for improvement. The appraiser has the freedom to make recommendations for future action on the basis of assessment done.

Based upon the way it was used, the Performance assessment form appears to look like some kind of dialogue guide for the improvement of the competences within the learning approach, because it creates awareness of the areas that need some improvement. It's a participatory form of assessment. It implies that if this kind of assessment is used, then it needs to be used on regular basis since performance by the same teacher on certain periods may differ or may depend on situations.

I involved some of the students who took part in the project in the assessment of my practice of facilitating the learning process. Still the aim was to evaluate the key aspects involved in the facilitation process through identification of the attributes that the students were satisfied with compared to the way I previously did it, noting areas where they felt I should have done better while facilitating the learning process. This was to help me know areas that I have improved on and some areas that needed further emphasis for improvement.

The interaction process was in a way of oral interview as earlier on discussed in page 73. Notably, the students looked more pleased with the aspect of participation, where both the

teachers and the students were involved in the learning process. Despite the challenges met in group work, students still said it was such an important aspect in their learning since it has helped them to analyse some topics including those not taught. The integration of theory and practice was one of the areas they (students) felt was important for their learning

The students also cited some changes they had seen regarding to the way I conducted the practice of facilitating the learning processes. To them (students), the remarkable improvement that they had seen was the inclusion of democracy in all the learning activities, in and out of the classroom. They were happy with the way I had given them the freedom to express their opinions, while others asserted that I had become simpler to deal with. Students were able to recognise the improvements given that they had prior knowledge of the challenges imposed by the previous method of learning (lecture approach).

This kind of environment increased on the level of interaction and participation by the students. Students attributed the improvement in my practice to my coming to Norway and possibly working with white people, but I think it's just the sense of maturity that I developed as a result of my involvement with Masters in Vocational Pedagogy; which has greatly shaped my thinking and the way of doing things. Through this Masters program, I learnt to place value on my practice and working with purpose.

Though Chowdary et al, (2004) think that improvement in teaching can be demonstrated by consequential improvement in learning, I think this does not need to form the basis for improvement in the teaching practice because there are quite a number of factors that can improve the learning of the students which are not connected to teaching by the teacher. For example the interaction with the environment which could be out of school, interaction with friends, and participation in community activities among others.

Their argument (Chowdary et al, 2004) could still "hold water" if the attention is given to the learning that is realised because of the teacher's effort, though the immediate trouble would be the difficulty in determining this specific learning imparted by the teacher, bearing in mind that students are not confined to one room and learning takes place everywhere at any time. There is also a possibility that the students may not learn what the teacher had intended them to learn, not forgetting the fact that in project based learning, it's the students driving the learning process.

5.3 Feedback from the learners:

Feedback from the students to me in form of appreciation letters gave an indication of how the students felt empowered with the innovation. It gave hints on the areas that the students felt comfortable and therefore giving an insight of how well we shall progress with the innovation. Below are some of the student's letters I have picked to reflect upon. I have intentionally withheld the names of the students for confidential reasons.

*I am writing this letter to you sir, appreciating for the good work done and the spirit you are showing to us as senior three class. In this project, we as students are benefitting and acquiring very much, for example we have improved on our vocabulary, acquired skills and knowledge since there is both practical and theory work and we students have got courage since we are not embarrassed during discussion work. Now we can manage to introduce other projects like poultry, cattle rearing etc. I am encouraging you to continue with the same spirit and helping the rest as you have done to us. **From student L***

*I humbly thank you for the learning we have got; teaching has been very well because I have got skills and knowledge from my fellow students in our group discussions. I have known how to start the project and some ideas which I can also tell somebody who is preparing to open the project like pig rearing. **From student J***

*Sincere appreciation to my Agriculture teacher; I am appreciative of the way teaching has been done because concepts are being understood both practically and mentally. The current teaching has enabled us to form group discussion which has improved on esteem, free expressions. Another amazing thing is that I thought it was a joke when our teacher told us to make group discussions in order to suggest the way of working and choosing projects to carry out. **From student T***

In most cases, words or letters of appreciation are given to someone for having done something good, but it's all useless if the letters do not point out the actions that deem the appreciation necessary or good, so that the appreciated person can reflect on his or her actions to realise the goodness in them and make judgment on which other situations to use such actions. Though I felt good being appreciated by my students, I was more impressed by the content of the letters

which indicated the concepts used in the innovation (group work, integration of theory and practice) that resulted into the benefits being realised by the students.

Just from the learner's expressions, project based learning created significant learning experiences, the kind of learning where the outcomes are significant with value addition to student's life through preparing them to participate in multiple communities (Fink, 2003). I do not proclaim that the approach is a solution to the learning needs of the students, but at least it leads to better learning by the students. Though it may be impractical to have the whole curriculum project based, Schlemmer et al, (2008) argues that it's important to ensure that at some point each year, the students are given the opportunity to apply what they have learned to something beyond recalled facts and complete tests and this may be in a way of projects since they give opportunity for the application of skills, understanding of the process and grasp of concepts.

5.4 The evaluation of the Action research process:

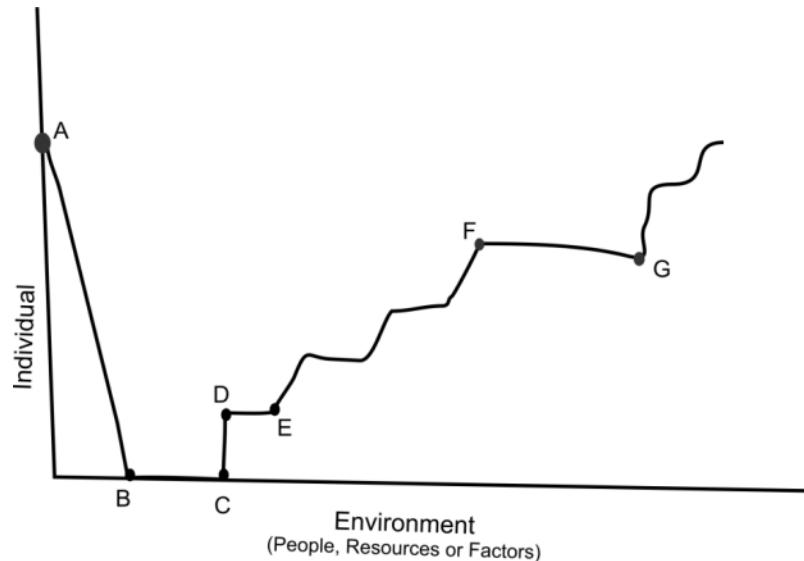
The general assessment as per objective three of the Study is based upon the arguments made in the discussion on the experiences met while working with the innovation. Critical engagement with the findings gives a reflection on the extent to which I have learnt and understood project based learning approach, including what it entails and how to use it in the learning of Agriculture. All this is self explanatory in the presentation, discussion, and conclusions made in this research report.

The use of Action research as a methodology seemed to have served the purpose better. Something clear about Action research now is that a given situation has to prevail in a way that is not satisfying the practitioners (and in this case I was not satisfied with the teaching/learning methods that my colleagues and I were using in the teaching of Agriculture). This provoked me to involve my colleagues in making an inquiry into the situation targeted towards improvement.

Action research as a methodology worked in the sense that it brought together the different stake holders within the school in dialogue. Through actions, we were able to exploit the diverse experiences in a reflective way that generated a common understanding during the implementation of the innovation. The process of Action research allowed the experimentation of the ideas with continuous evaluation and with the relevant actions performed. In fact the

participants developed the thinking that Action research is a “trial and error” approach of dealing with the problems.

Fig.5.1. Diagrammatic representation of the research process



Having gone through the process of research, I took some time to reflect upon the actions that happened in the process of implementing the innovation. The journey was never straight forward. Though the participants agreed and disagreed, we always found a common point that ensured progress. Fig.5.1 above gives an illustration of how the journey was. Therefore it may not be taken as a total discovery of a new model of Action research, its developed based on personal reflections on the working process experienced.

At point A, I assumed this was me developing the idea. Then I had to come down to have a common understanding with those involved (B), because it became apparent that my ideas and values did not stand in isolation. For example, before the start of the research, my focus was on personal values (own improvement), but I got challenged by one of the learners during the first workshop, who argued that he was still young to make choice about his future given that he was doing nine subjects including Agriculture. His view was that it would be wise for all the teachers to implement the innovation (project based learning) to enable the students make judgment on what subjects would meet their future career needs.

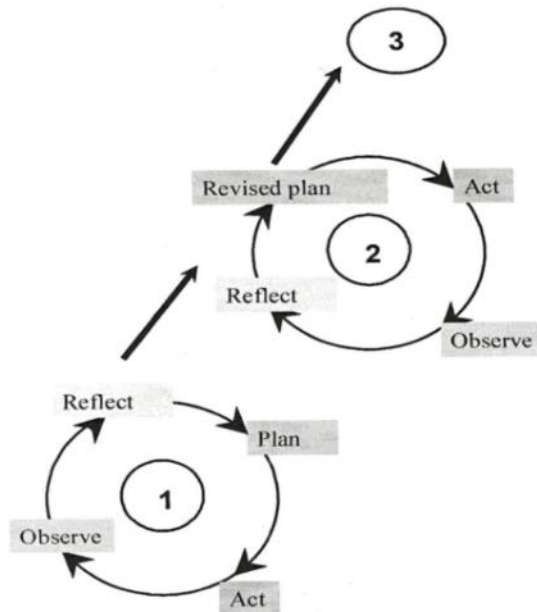
When I reflected on these views by the student, I realised that this could possibly make the problem statement bigger. The student was actually looking at the possibilities of working with

the innovation at general school level. Together, we made connections to different factors and hence laid the foundation (B-C). C-D represents take off stage, but the process meets other systems that needed to be connected and addressed. The research process gets diverted to address the upcoming issues. The process continued in the same way but in zigzag motion, meaning that each step taken had to be evaluated before progress was made.

F- represents the peak of the research, and the time for data collection was getting finished, so the participants had to undergo through the long period of evaluation (F-G). It's in this stage that new ideas started coming in, which can now be used as recommendations for the improvement of the actions within the innovation. We had to ask ourselves questions like; what worked or what did not work in the process? In this case, I see Action research as a research process that makes use of reflective learning on past experiences to inform further actions. This makes the process to look continuous and may be difficult to trace when to stop. In every experience encountered, there was something to reflect upon and this resurrects the process of inquiry.

Ortrun, (2009) perceived the activities in Action research to be cyclical and came up with the model which he called the “spiral Action research cycle” as presented below.

Fig.5.2. Spiral action research cycle, adopted from Ortrun, (2009:72)



Some notable arguments from the spiral Action research cycle (fig.5.2) that relate to my illustration on Action research process (fig.5.1) are; the concept of the journey not being straight, there is also a sign of progress in both which may indicate that improvement is being realised. As per my understanding, the curve does not come to zero, because once the innovation has started, some change may be realised, which may just involve the change in the way of thinking by those involved. The process of Action research can therefore only stagnate until further action is taken for re-improvement.

Though the process may be cyclic as noted by Ortrun (fig.5.2), it is not cyclic to the extent that practitioners repeat work or rather working while revolving within the same idea. It's actually the same kind of planning but not with the same actions, because as the participants get involved with issues, they work with them, assess and then come back to the drawing board to see the way forward. They then continue in the same way of working until the goal is achieved. This is why it is difficult to define the exact point to stop with data collection in Action research.

Tracing the journey of the Action research process as illustrated in fig.5.1, the process entails carrying out an inquiry into issues of concern (research), performing activities with the generated information (Action), reflecting together through dialogue (participative) in order to explore and accommodate the different views, while being democratic as much as possible to ensure that the decision taken is not against the will of the people. In this way, the whole team of participants will be accountable for whatever happens in the process.

5.5. The validity and reliability in the research

In this section, I present a brief discussion of the relevance of the information gathered in meeting the research objectives. The questions I asked myself at this point included; have the research objectives been achieved? If yes, what could be the “yardstick” for assessing the validity and reliability of the information gathered? To what extent can I generalise the information? It forms part of the evaluation process, and the demonstration of validity may form the basis for judgement of the work done (Jean McNiff & Jack Whitehead, 2009). Goodwin, (2010) adds that validity tells if the measure actually measures what it is supposed to measure and not something else (pg.134).

Whereas reliability means getting consistent results from the same measure, validity refers to getting results that accurately reflect the concept being measured (Earl, 2010:158). Donald et al, (2010:239) recognises the distinction between reliability and validity in the research. According to them (Donald et al), reliability is all about how consistently one is measuring whatever he/she is measuring, whereas validity looks at the meaning and the interpretation of the scores.

I think it's all about the worthiness, meaningfulness of the data and the quality of the actions taken in the research process. According to Hammersley, (1992:92) as cited in Altrichter et al, (2008:149), an account is valid or true if it represents accurately those features of the phenomena that it is intended to describe, explain or theorise. "If a piece of research is invalid, then it is worthless" (Louise et al 2007:33).

Though the validity and reliability of the research can be demonstrated by its replicability and transferability (Earl, 2010:150), Jean McNiff & Jack Whitehead, (2009) say that in Action research, it's not all about applying other people's theories to your practice but generating your own living theory of practice from within practice. They suggested two kinds of validity for knowledge claim; that's personal validity (which involves own values, which form the grounds for the research) and the social validity (which involves people agreeing on certain ground rules for their thinking and actions).

Never the less, as I have indicated in chapter one under the limitations of the study, it is possible to think that some factors may have an effect on the generalisation of some of the findings. For example, the process of working with restrictions posed by the curriculum and the time not being enough. If much time was available, it would have been possible to repeat some of the actions performed in the research process just to concretise the validity of the claims.

However, throughout the research process, we (the participants) were conscious of the validity aspect. We ensured that the data collected was valid by;

- Making use of the various methods to collect the data, which Altrichter et al, (2008:144), Louise et al, (2007:141) referred to as triangulation. As pointed out in the methodology part of this research, I , along with other participants made use of observations, research journals, personal logs, student's logs, interviews, and regular dialogue meetings to

ensure that we take care of the discrepancies and areas of similarity in the interpretation of the situations. This helped to minimise bias in the interpretation of the situations.

Altrichter et al (2008) recognise triangulation as an important method for contrasting and comparing different accounts of the same situation. Their argument (Altrichter et al) lies in having wider sources of data and getting a point of interception for those involved hence leading to more meaningful information about the situation.

- Besides the use of the research participants, I have made considerations to the alternative ways of thinking by other people (outsiders) regarding several ideas documented in this report. Other teachers and the school administration took part in the evaluation process of this research project. My own colleagues (Master's Students of Vocational pedagogy) have had their input in the analysis of the data presented in this research report. Both categories gave their independent opinions and views regarding the claims I have made in this document. This helped so much in the improvement of the quality, reliability and the validity of the data collected in meeting the research objectives.

Altrichter et al, (2008) believe that when the perspective of the person who is outside of the situation is added, there is more reason to believe the meaning that one has attributed to the data. To them (Altrichter et al), an outside perspective increases the likelihood that the participants “located” an accurate interpretation of the data. This is what Louise et al (2007:135) called internal validity, which seeks to demonstrate that the explanation of a particular event, issue, or set of data provided in the research, can be sustained by the data. They (Louise et al) recommended the use of multiple researchers, the use of participant researchers and using peer examination of data.

- The design of the research project itself says much about the validity of the data collected in addressing the research objectives. Being an action research, we (the participants) got involved in mini action research cycles. Through this process, it was possible to re evaluate the actions taken in the research project meaningfully in a reflective way. It was possible to see what worked and what did not work. This alone could send signals on the validity of the actions performed and the interpretation of the data. The fact that the

research objectives were achieved as seen from the success indicators, this could imply that the actions that were performed were relevant and therefore the data collected is valid as per the research objectives.

5.6 Summary of chapter five

This chapter attempted to examine the extent to which the students, other teachers and I have benefited from the research project. Evidently, there are notable areas of improvement in my practice. I think I have improved on my organisational abilities as seen from my involvement in the dialogue meetings at various levels within the school, while applying the principles of democracy and participation. Decision making abilities have also improved; I have also learnt to place value on my work and working as per the needs of the learners.

The evaluation process revealed that the process of the students sharing the experiences in groups brought better understanding of the concepts. Students also improved on their team work abilities as indicated in the formulation of group rules and use of democratic approaches. While looking at project identification process, the students seem to have mastered the skill of relating their studies to relevance in the society. They have learnt to experiment with ideas, while relating theory to practice. They have also understood the value of placing the “why” in whatever tasks they got involved in. This enabled them to reflect and realise the learning points. This besides other indicators, shows how project based learning has improved on the critical thinking abilities of the students and thus improved learning outcomes.

CHAPTER SIX: REFLECTIONS, RECOMMENDATIONS AND CONCLUSION

6.1 REFLECTIONS AND THE LESSONS LEARNT

We (the participants) looked at project based learning as an approach of teaching and learning which begins with the identification of the relevant issues emanating from the daily encounters (problems). The students identify the relevant project tasks to address the problem, students work with these project tasks in groups (collaborative and participative) while making reflections and later documenting the experiences to be shared with the rest of the students and the teachers. This means that both the means (the process) and the end result are important.

Project based learning encourages the students to be searchers for knowledge other than receivers. When projects are used as a method of teaching/learning, the students perform the activities with the aim of completing them. They will then try as much as possible to look for the information. This therefore, means that project based learning encourages the students to be researchers in their own learning. It involves doing things and learning from them. Making learning in form of inquiry deepens the learning process; students own the knowledge, develop problem solving abilities and become lifelong learners.

The process of project based learning necessitates that the students take charge of their learning activities, which they do in groups. Often, disagreements are realised because some students come with misconceptions about certain practices. Though some of the students feel rejected when disproved, Project based learning gives the opportunity to the learners through hands on and minds on activities to clear such misconceptions and relate content to context.

While working with project based learning, there is need for us the teachers to respect learner's knowledge and the experiences that they bring into the learning process. In this way, they will be encouraged to try and experiment on their ideas. This may also induce positive attitude to the learners. But there is need for the justification of some of the experiences with scientific evidence. For example, practically, there is a relationship between the number of teats in a sow and the litter¹⁹ size, but we failed to have some kind of scientific explanation to back this argument.

¹⁹ Litter is a group of piglets born. Litter size therefore means the number of the piglets per birth.

Other outstanding skills visible as a result of learning through project based approach are:

- Communication and presentation skills.
- Organisational/Leadership skills with respect to democracy.
- Time management.
- Team work (group participation) and respect for every ones views.
- Decision making skills.
- Students get the social aspect of life.
- Students learnt assessment skills, because I could see how a group of learners would question one another's assertions.
- Project based learning inculcates into the students the capacity to do as they get involved. This alone brings self-satisfaction in the learning process.

I did not know that my students posses a lot of knowledge! Project based learning provides an environment for the learners to explore their ideas and opinions. The teachers just need to provide an atmosphere that facilitates the exploration of meaning by the learners so that they can feel safe and accepted. For example, none of the students was blamed for the mistakes made in the learning process, because this was learning by itself. It was also a good practice to make use of the local materials within the environment, because this is what was known to the learners.

One of the pertinent issues that I noticed while working with the students in project based learning was the need for communication, which I would prefer to call feedback on student's learning. It sounds simple, but has a lot of attachments in terms of the approach and the language the teacher may need to use. I learnt to facilitate good communication with my participants through;

- Giving the learners the attention whenever needed, this includes listening to their views in a respectable way. Gordon, (2003) referred to it as Active listening which involves making sense of what I hear through paying attention, interpreting and remembering.
- Asking questions and being receptive to responses. Open ended questions worked well as they encourage students to talk. For example; instead of saying are there any questions? Which is commonly asked by teachers; I would say "I have seen several suggestive looks, what questions do you have?" This was enough to provoke someone to talk.

- Getting feedback from the learners in the process of communication helped in evaluating my communication. It's important to create an environment of no fear by the students, an environment of free expression. Students just need to respect me as their facilitator but not fearing me. In this case, the students will be in position to freely give feedback to the teacher. The teacher can then use this feed back to improve on his or her future lessons or communication with the learners.

While working with project based learning, there is need for the teachers (facilitators) to be foresighted and provoke the learners whenever necessary, otherwise important skills may be missed by the learners since some of them may end up working aimlessly. Teachers may use provocative questions to ensure that learning takes place at every stage. The teacher needs to be “foresighted and have a critical eye” to see what the students cannot see. This may also call for mastery of the content by the teacher but he has to guard against driving the learning process or being at the fore front of the learning process.

The findings had also pointed out major worries on how much Project based learning would deviate from the existing learning approaches, fear of loss of curriculum, fear of loss of control of the assessment process and a lot of time being lost, but for effective learning and participation, the teachers need to focus on classroom control and safety, carry out regular monitoring of group progress, and ensuring relevance of the activities. It's also important for the teachers to understand the adolescence characteristics to be able to effectively carry out guidance and counselling of the learners in the learning process of Agriculture.

It's now my wish that the participants get the vigour to push on with the innovation, so as to generate more knowledge that will pave way for the expansion at various levels. It's all about change of attitude and the thinking by the different stake holders. Mere change of attitude by the various stake holders, students and teachers will create bigger impact towards the expansion of the innovation. Teacher's attitude impacts negatively on the learning process, because if a teacher thinks that he cannot facilitate the learning process in Agriculture very well in the absence of a school farm, which of course is the true thinking of our teachers, it may be difficult for such a teacher to make use of his/her full abilities.

Change is all about setting the required mind piece for the change and having the belief that it is possible to achieve it through reflections and correction of the past mistakes within the change process. Fullan, (1993) acknowledges that there is need for a shift of mind in order to achieve the concept of educational change. He adds that without such a shift of mind, the insurmountable basic problem is the juxtaposition of a continuous change theme with a continuous conservative system.

For continued progress with the Project based learning environment, emphasis need to be placed on continued practice by both the students and the teachers on the skills needed to make Project based learning effective, for example, more discussion is needed with the different stake holders on the assessment criteria for the students and making the curriculum more flexible. Teachers need to continue making cordial relationship with the learners so that they learn to own the innovation and support its continued expansion. This needs to be done along with regular evaluation to ascertain whether the innovation serves the purpose better.

Action research has provided me with deep insight about my practice. The level of confidence in practice has progressively improved. I am also pleased when I hear from colleagues, students and other observers within and around the school on how the innovation has transformed their thinking in relation to the teaching-learning process.

The use of Action research as a methodology in professional development and self evaluation in practice contributes significantly to the improvement in practice because the knowledge is generated from within the actions taken by the participants, which enhances creative and innovative thinking by the participants. It's all about people empowering themselves in the quest for practical ideas to the challenges being faced in their practice situations. It's important that participants look at themselves as learners in the process. This will permit all the participants involved in the process to own their mistakes and be responsible for all the actions taken.

I learnt that teachers never stop learning to teach. In fact the innovation provided me with the new insight of teaching verses learning. There is need for teachers to help each other in the process and learn from each other, though most of them hold the belief that receiving assistance is a sign of incompetence. Teachers have the will to see learning take place in a better way but

the school conditions that places emphasis on performance by the learners in the final exams forces the teachers to conduct the practice of teaching in the way that meets the school goals.

I also learnt that new innovations just don't need to be rushed for implementation, unless certain conditions are in place, which I would call the enabling environment like; the understanding of the working process with the innovation, otherwise if done hurriedly, it will slow down the innovation. This is because one will have to always go back into the basics of laying down the foundation. For instance, my participants took long without mastering the art of making study logs, yet it was such an important tool for learning and data collection. Arvind, (2010) referred to these conditions as learning barriers that restrict the process of innovation in organisations.

Through this kind of hands on and minds on activities in project based learning, I have learnt that what works in theory or as seen (read) from text books, does not necessarily work in practical situations. What is written in books should possibly be based upon the context under which it was written because the same writings may not necessarily work in all the situations. There is need to relate content to context and real world situations.

Given that the journey in Action research was not straight, one has to be cautious of the objectives and the purpose behind the research. This will keep him or her focused, though deviations in the process are necessary to cater for the different interests and brings in better team understanding. Refusal of these deviations may burry democracy in the process of Action research and later on may suffocate sharing of the wider experiences.

At the beginning, most teachers had little trust on the student's ability to make their own learning decisions. But it was surprises as the students took charge of their own learning in projects. I therefore think that the ideal way to deal with fear factor related to change is to be involved and thinking within the circle of change. Through this involvement, new experiences are encountered, reflected upon and will then facilitate further actions to be undertaken.

6.2 RECOMMENDATIONS

When students complete tasks in Projects, they learn from them. What remains an issue for further investigation is the extent to which this learning is transferable from student's school learning Projects to the society projects (work projects). Will the learners be able to transfer the learning to other projects? Not forgetting the different environmental factors and conditions that may limit the transferability of this knowledge. It may also depend on how well the students deal with other challenges affecting Agriculture at large in the society, because numerous problems like lack of capital, poor marketing facilities, pest and diseases still hinder Agricultural development in most communities in Uganda.

It is not possible to think that one can scrap the current Ugandan education system in order to utilise Project based learning as a change agent. It became apparent that we were to look for ways of using Project based learning approach within the existing system. The process takes time. For success to be achieved there is need to continue building broad base ownership amongst the different stake holders in education by seeking their participation and ideas on the possibilities for the expansion of the innovation. This will ensure adequate dissemination of information and addition of value to the process.

Whereas there is a remarkable improvement in the way I conduct my practice, there is also need for further analysis on the sustainability of the acquired improvement by looking at how I can make it part of me. Because as I think of the expansion, there is need to maintain the momentum for those participants and stake holders who have already experienced with the innovation. Teachers need to be empowered in the practical assessment of the learners, to see what works and what does not work in the process of assessment, so that they can make relevant recommendations for the improvement of the curriculum, in relation to the society needs.

6.3 CONCLUSIONS

This investigation confirms that the educational concepts and values embedded in project based learning can be used at secondary school level, so long as relevant and meaningful content is used as per the learner's abilities. Project based learning is achievable in totality but there is need for the students to engage in the activities that build on their prior knowledge and allow them to apply that knowledge to new situations.

The problem statement has been answered by the research as evidenced by the quality of project reports presented by the learners, which manifested practical reasoning by the students and student's ability to relate theory to practice. This is a revelation of better learning outcomes, though there is still room for improvement. The increased level of interaction between us the teachers and the students, teacher's involvement in the counselling of the learners, teamwork by the teachers, all contribute to the improvement in my (our) practice of facilitating the teaching-learning process by the students.

For the achieved improvement to be sustained and measure up with time, there is need for us (the teachers and students) to develop the habit and make use of the achieved skills to continuously inquire and learn, continue to seek for new ideas from within and from without. Otherwise the improvement will be short lived. In every year, the teachers deal with new students who are different. This calls for new strategies of teaching/learning. It means we have to think of the new ways of doing things and keep modifying our actions to suit the student's learning needs.

For quality education to be achieved, the students and the society needs should be put at the centre of the learning process. The schools need to consider the achievement of the learners after completion of a given level of studies (in terms of their abilities) as the first priority, since the schools exist because of the students. With many complexities surrounding our education system, it may also call for the individual teachers to develop own values and attitudes regarding the practice of facilitating the teaching-learning process.

LIST OF REFERENCES

- Altrichter, H., Feldman, A., Peter, P., & Somekh, B. (2008). *Teachers Investigate their Work. An introduction to action research across the professions* (second ed.): Routledge, 2park square, milton park, Oxon.
- Arvind, U. (2010). *Project Based Innovation and Learning: Concepts and Research*: Lambert Academic Publishing AG & Co.KG, Germany.
- BIE. (2012). Project based Learning. Retrieved 08 March, 2012, from http://www.bie.org/about/what_is_pbl, <http://www.pbl-online.org/About/whatisPBL.htm>
- Billett, S. (2001). *Learning in the Workplace: Strategies for Effective Practice.*: Allen & Unwin, National Library of Australia, Australia.
- Bjerknes, E. (2002). Learning and Counselling. In T. Inglar (Ed.): Akershus University College, Norway.
- Chowdary, S. B. J. R., Naga, R., & Bhaskara, R.D. (2004). *Mastery of Teaching Skills*: Discovery publishing house, New Delhi-110002, India.
- Darla, L. G. (2008). Project based Learning as A facilitation of self-Regulation in a middle school curriculum Available from http://books.google.no/books?id=qLuU6_rlCSwC&pg=PA43&dq=project+based+learning&hl=en&sa=X&ei=24uNT862I47P4QTXouC_Dw&redir_esc=y#v=onepage&q=project%20based%20learning&f=false
- Dewey, J. (2010). *Democracy and Education*: IAP, Lits, LAS vegas, Nevada.
- Donald, A., Lucy, C.J., & Chris, S. (2010). *Introduction to Research in Education* (Eighth ed.): Wadsworth, cengage learning, Belmont, CA, USA.
- Earl, B. (2010). The Practice of Social Research Available from http://books.google.no/books?id=QySynvetGQIC&pg=PA158&dq=validity+and+reliability+in+research&hl=en&sa=X&ei=lb-sT7rflvDE4gTAjd20Aw&redir_esc=y#v=onepage&q=validity%20and%20reliability%20in%20research&f=false
- Farrant, J. S. (1980). *Principles and Practices of Education* (New ed.): Longman Group UK Ltd.
- Fink, L. D. (2003). CREATING SIGNIFICANT LEARNING EXPERIENCES; An Integrated Approach to Designing College Courses Available from http://books.google.no/books?id=yycqudpQkQwC&printsec=frontcover&dq=creating+significant+learning+experiences&hl=en&sa=X&ei=olONT-2MCMXk4QSzkqWQDw&redir_esc=y#v=onepage&q=creating%20significant%20learning%20experiences&f=false
- Fullan, m. (1993). *Change forces: Probing the depths of Educational Reform*: The Falmer Press, 4 John st; London.
- Gail, B., Fisher, J., & David, H. (2001). *Teachers Doing Research. The power of Action through inquiry* (Second ed.): Lawrence Erlbaum Associates publishers, mahwah, New jersey, London.
- Goodwin, C. J. (2010). RESEARCH IN PSYCHOLOGY: Methods and Design Available from http://books.google.no/books?id=eNsVUGTMcDoC&pg=PA134&dq=validity+and+reliability+in+research&hl=en&sa=X&ei=lb-sT7rflvDE4gTAjd20Aw&redir_esc=y#v=onepage&q=validity%20and%20reliability%20in%20research&f=false
- Gordon, T. (2003). *Teacher Effectiveness training*: Three Rivers press, New York.
- Greenwood, D. J., & Levin, M. (1998). *Introduction to action Research. Social Research for social change.*: SAGE publications, Inc. Thousand Oaks, California.
- Illeris, K. (2007). *How we Learn: Learning & non - Learning in schools and beyond*: Routledge, 2park Square, Milton Park, Abingdon, Oxon OX14 4RN, London.

- Illinois, E., & Winfred, F.H. (1971). Learning: A survey of Psychological Interpretations Available from http://books.google.no/books?id=sS0OAAAAQAAJ&printsec=frontcover&dq=learning&hl=en&sa=X&ei=e5x9T4Xef8yN4gTr_7SCDQ&redir_esc=y#v=onepage&q=learning&f=false
- Karin, A. (1999). *Strategies for change in corporate settings. A study of diffusion of organisational innovations in a Norwegian corporation*: Norwegian University of Science and Technology.
- Kyriacou, C. (1997). *Effective Teaching in Schools: Theory & Practice* (Second ed.): Stanly Thornes Publishers Ltd, Cheltenham, United Kingdom.
- Louise, C., Lawrence, M., & Keith, M. (2007). RESEARCH METHODS IN EDUCATION Available from http://books.google.no/books?id=i-YKKgtngiMC&pg=PA133&dq=validity+and+reliability+in+research&hl=en&sa=X&ei=sD6sT7DxM4qI4gT6rJmuAw&redir_esc=y#v=onepage&q=validity%20and%20reliability%20in%20research&f=false
- Mary, J., McCormick, R., Paul, B., Patrick, C., Mary-Jane, D., Alison, F., MacBreath, J., Bethan, M., David, P., Richard, P., Sue, S., Joanna, S., & Dylan, W. (2007). *Improving Learning: How to Learn; Classrooms, Schools and Net works*. Available from http://books.google.no/books?id=sx5vGLTD0g4C&pg=PA3&dq=learning&hl=en&sa=X&ei=97N-T4u6DY0I4gTx_vWjBw&redir_esc=y#v=onepage&q=learning&f=false
- McNiff, J., & Whitehead, J. (2009). *Doing and Writing Action Research*: SAGE Publications Ltd, London.
- Michael, J. A., & Harold, I.M. (2008). *Active Learning in Secodary and College Science Classrooms: A working Model for Helping the Learner to Learn* Available from http://books.google.no/books?id=SDHXiDIm-wUC&printsec=frontcover&dq=learning&hl=en&sa=X&ei=e5x9T4Xef8yN4gTr_7SCDQ&redir_esc=y#v=onepage&q=learning&f=false
- Michael, P., & Felda, R. (2006). Inductive Teaching & Learning Methods: Definitions, Comparisons & Research Bases. *Journal of Engineering Education*, 95(2), 123-138.
- Michael, P., & Felda, R. (2007). The many faces of Inductive Teaching & Learning. *Journal of College Science Teaching*, 36(5).
- NCDC. (2008). *Agriculture Teaching Syllabus: Uganda Certificate of Education*: NCDC, Kyambogo-Kampala, Uganda.
- NCDC. (2009). *Curriculum Review in Secondary Schools*. Paper presented at the Annual National Headteachers Workshop, 27-28/01/2009, Kampala- Uganda
- Ngugi, D. N., Karau, P.K., & Nguyo, W. (1990). *East African Agriculture* (Third ed.): MacMillian publishers limited, Oxford Ox43pp.
- Norton, S. L. (2009). *Action Research in Teaching & Learning: Practical guide to conducting pedagogical research in Universities*: Routledge, 2park Square, Milton Park, Abingdon, Oxon OX14 4RN, London.
- Ortrun, Z.-S. (2009). *Action Learning and Action Research. Songlines through interviews*: Sense publishers, AW Rotterdam, The Netherlands.
- Schlemmer, P., & Dori, S. (2008). *Teaching Beyond the Test: Differentiated Project-Based Learning in a Standards-Based Age* Available from http://books.google.no/books?id=hhqeHOKVmbIC&printsec=frontcover&dq=project+based+learning&hl=en&sa=X&ei=XYiAT_DmMo6O4gT58snjBw&redir_esc=y#v=onepage&q=project%20based%20learning&f=false
- Scott, D. W. (2005). *Using Experiential Learning in the classroom practice: Practical ideas for all Educators*: Scarecrow Education, United States of America.

- Senge, P., Nelda, C., Lucas, T., Bryan, S., Dulton, J., & kleiner, A. (2000). *Schools That Learn: Afifth discipline fieldbook for educators, parents & every one who cares about Education*: Nicholas Brealey Publishing, Clerkenwell, London.
- Simkins, M., Karen, C., Tavalin, F., & Barbara, M. (2002). Increasing Student Learning Through Multimedia Projects Available from http://books.google.no/books?id=9QIlpYEWoE8C&printsec=frontcover&dq=learning+through+projects&hl=en&sa=X&ei=LhKAT69xiPvhBLnrNYH&sqi=2&redir_esc=y#v=onepage&q=learning%20through%20projects&f=false
- SRI, I. (2009). The power of project learning with think Quest Available from http://www.thinkquest.org/promotion/white_papers/WhitePaper.pdf
- Sutton, R. S., & Barto, A.G. (1998). Reinforcement Learning: An Introduction Available from http://books.google.no/books?id=CAFR6IBF4xYC&printsec=frontcover&dq=learning&hl=en&sa=X&ei=e5x9T4XeF8yN4gTr_7SCDQ&redir_esc=y#v=onepage&q=learning&f=false
- UNEB. (2011). *Principles & Practices of Agriculture: Practical Paper (527/2)*.
- Varun, V., & Patricia, A.W. (2005). *Development from within: facilitating collective reflection for sustainable change*: manavodaya institute for participatory development, lucknow, UP, india.

APPENDIX A: PIGGERY

This involves the management of pigs, with some reasons attached. It is an enterprise that was picked by the students to work with through Project based learning. I have intentionally made a summary of what it entails to be a pig farmer, to enable the readers to have an overview of the tasks that the students had to do in their respective groups. It is quite wide with a reasonable number of tasks or activities to work with. For example; Pig breeding, Nutrition, Health, Housing and Equipment, Record keeping among others.

The choice of the students to work with piggery was not a surprise to me due to numerous advantages attached to pig production. Some of them include;

- Pigs are simple to manage in terms of feeding since they are omnivores; have few diseases that affect them, demand less labour and can be kept in a small area.
- Pigs are more profitable because they produce large litter size, grow faster, have low gestation period and can produce at least three times per year.
- Pigs make a good combination with the crops in mixed farming because of the manure provided by the pigs which enriches on the soil fertility, while the crops harvested (residues) can as well be consumed by the pigs as food.

Major breeds of pigs are the large white, land race, saddle back and Sussex. These are normally raised in three different systems; scavenging pigs (where pigs are left loose day and night and on self supporting feeding); Tethering (where ropes may be used to tie pigs on specific areas of interest, and regular transfer between different areas is made by the farmers; Intensive system (where pigs are kept indoors (pigsty), all activities are done inside. But of course each of the above system has its own advantages and disadvantages.

What somebody needs to do in pig production!

Its import that anyone wishing to invest in piggery observes the following points: To begin with, he must be aware of the challenges associated with pig production such as, the need for capital, feeds and disease control gadgets. He then has to work towards minimising them.

Breeding: Is the mating of pigs in a planned manner. This must start with the selection of the parents to mate. In doing this, I normally base on; (a) Records kept, ensuring that there is no

history of any defects inherited, (b) Health records to ensure that there is no disease, (c) Relate to the performance of the relatives and pedigree. While making this selection, specific qualities are of interest, like the rapid growth rate, having sound feet to support the mounting boar, should be long in size to accommodate large litter sizes.

Signs of Heat in pigs

It's important to be able to identify the signs of heat in a sow/gilt to ensure that it is mated at the right time or age. Breeding system depends on the farmer's choice, either to use natural means or artificial insemination. Major signs are; immobility by the sow, arching of the back, pricking of ears, red valva, mucus discharge, the sow stands still when weight is applied on the back, and the loss of appetite.

The sow comes on heat every three weeks. This heat period (oestrus) lasts for 30-60 hours. Ovulation then happens 36-40 hours after the onset of heat period. Maximum fertility period occurs during the mid-oestrus (around ovulation) and this is when serving should be done or day one on heat observation and repeated 24 hours later. Gilts normally reach puberty at the age of 6-8 months, but breeding (serving) should be done on third heat period so as to not to retard their growth.

Before serving the sow, it's important to carryout Flushing of the sow/gilt. This is improved feeding of the gilt/sow by increasing the energy and protein intake of that sow/gilt for about two weeks before breeding. This will stimulate the ovary to produce large numbers of eggs. In fact properly flushed pigs shed 2-3 more eggs. This should be followed by putting back the flashed sows on limited feeding to avoid rapid weight gain and decreasing embryo death losses.

Management of pregnant sow and preparation for farrowing

The gestation period lasts between 114, 115 and 116 days. Good feeding including minerals, mixture of pasture and sow meal (at a rate of 2.5kg/day) should be given. In the last month of pregnancy, this can be increased to 3.5kg/day. There is need to provide clean water all time. Carry out deworming before farrowing. Take the sow to a clean farrowing pen two weeks to farrowing. Provide grass to the farrowing pen for nesting/bedding. Wash the sow with clean water before farrowing and disinfect the farrowing pen.

In doing all these, it's also important for the farmer to be able to recognise the signs of farrowing so that he can make adequate preparations. The major signs may include; the sow becoming restless, the presence of milk at the teats 12-24 hours before farrowing, enlarged teats, and the valva becomes swollen and the sow may be seen preparing its nest from dry grass.

Management of piglets from farrowing to weaning

At this stage we assume that our sow has given birth, so we need to do the following to manage the young ones. Make a record of birth weights, sex, and litter size. During the first two days after farrowing, decrease on feed intake to avoid digestive disturbances but avail plenty of water.

Piglets mostly suffer from piglet anaemia, since they are born with small reserves of iron in their body, yet the mother's milk is a poor source of iron. The major symptoms may include paleness in the ears and the belly, rapid breathing rate and diarrhoea. Control is by putting fresh clean soil in the house, injection with iron solution three days after birth, giving iron pills, and on daily basis smearing the mother's udder with iron.

Creep feed is introduced to the piglets gradually from day seven. Provide water adlib. Do ear tattooing for identification purpose at six weeks of age. Castrate male pigs not needed for breeding (day before weaning). Provide warm conditions by laying litter on the floor. At weaning time, the Sow is taken away from the piglets gradually. Weaning is done at 6-8 weeks of age. After weaning, reduce on food intake by the sow to fasten drying off.

Housing and equipment

The house should aim at protecting pigs from bad weather given that they are sensitive to changes in temperature. A good pigsty should have good drainage, sloppy for effective flow of the urine, good ventilation for air circulation, roofed to provide cool environment, strong, spacious, dry and warm. It must also have the farrowing pen, rearing pen, fattening pen. The farrowing and rearing pens should have guard rails.

Good housing also reduces disease and parasite transmission. In deciding what kind of pig house to construct, one should consider a house that reduces labour input but increases efficiency in the management.

Nutrition

It's good to note that pigs are omnivores. Common feeds are maize bran, rice bran, fish meal, and grass. The daily nutritional requirement of pigs is highest during the early phase of their life and gradually decreases as they approach maturity. Feeding depends on the stage and for which purpose the feed is given. For example, is it for flushing, farrowing phase, lactation, growers, finishing stages? Common feeds in specific ratios are; creep feed with 16% protein, pig finishing meal 12% protein for fattening. Other essential minerals are calcium, phosphorous, sodium chloride, (Ngugi et al, 1990).

Health

Many of the diseases are associated with bad management, poor feeding, and negligence. Well managed pigs are healthy, and well fed pigs are disease resistant. Most common health problems are: Parasites such as roundworms, (ascaris), tape worms, lice, fleas, Mange. Major diseases are African swine fever which is viral, major symptom is vomiting, diarrhoea and fever. Generally, the major indicators of sickness in pigs are; dullness, curly tail, dry coat, high body temperature, groans and grinds teeth, lies down, coughing and loss of appetite.

Record keeping

This is good for the purpose of follow up of the events. Possible record kept can be like this:

Table A1. Example of record keeping in piggery

Sow number	Date of mating	Birth date for piglets	No. of piglets	Weaning date	Number weaned	Average age at weaning	Remarks

APPENDIX B: LOG SAMPLE

WEEK 15 & 16 LOG

18/10/2011

ACTIVITY	EXPERIENCE	REFLECTION
<p>Student's presentations on project activities-reports. The reason was to help students reflect on their reports to bring about learning, and also for them to share their experiences in similar or different tasks.</p>	<p>-some groups had left out the "why" aspect in their discussion. For example why certain things are done as they did.</p>	<p>Without this "why" aspect, it is difficult for the students to reflect and realise the learning points. In this case routine activities may be performed or replicated just with the aim of getting them done without critical thinking. -This also necessitates continuous probing questions by the teachers as facilitators of learning.</p>
	<p>-There is a lot of evidence of learning as students relate theory and practice, but agriculture being a science subject, some facts needed to be supported with scientific evidence.</p>	<p>There is still need for the students to set up experimental tasks to concretise some assertions. For example, one group stated that the number of teats by the female pig determines the number of piglets (young ones) it will produce. This would mean setting up experimental design,</p>
	<p>I was still able to recognise that project based learning necessitates the use of the driving question which must be open ended but requiring students to use high order thinking skills to create a response; But what about the intellectually handicapped students....how do they fit in the process?</p>	<p>I relate this to the study objectives; does it meet the objective or it deviates because if the purpose is to increase the learning out comes by the learners, then it would not be good to base measurement on cognitive abilities alone, But I was of the view that the nature of the question should depend on the agreed set objectives between the learners and the teacher and what works at classroom level for the participants</p>

<p>Dealing with the issue of assessment(all participants) Aimed at establishing the extent to which learning took place and whether the objectives have been achieved</p>	<p>This was based on the quality of the report. The quality report according to us has to reflect on practical reasoning, answer the driving questions, relates theory with practice. Assessment was also based on the quality of the work done, physical observations on activities, logs and the objectives of the study.</p> <p>-Though the whole idea was not all about grades, normally at the end of the year, students do exams which have to be graded and this is what they present to their parents to see. They therefore noted that though they have got skills, there is nothing they will show to their parents as evidence of having been at school.</p> <p>-though others proposed that the teachers award marks for groups based on the reports presented, majority refused the idea, citing poor participation by some members and so, they do not wish to have the same marks</p>	<p>I see the need to set test questions which must reflect on project activities done. This will help us to get the individual grades students need but it would also help us in further analysis of the extent to which learning took place.</p>
<p>Discussion on student's participation. Aimed at seeking for views on the few who still have poor participation, and how to deal with it in the next project activities</p>	<p>One major observation is that those few students with poor participation seem not to be confident with themselves and colleagues especially where factual information is needed. But I attribute this to the education system which has been spoon feeding learners with information.</p>	<p>I see that with continuous practice of the new approach of project based learning, these learners will be empowered, and it is just a matter of time.</p> <p>I am also looking at the need to reward the most outstanding participants with certificate of merit, maybe it can further motivate others to participate.</p>

APPENDIX C: TEST QUESTIONS USED DURING EVALUATION PROCESS WITH THE STUDENTS

NALLIWA SECONDARY SCHOOL
 END OF TERM III EXAMINATIONS 2011
 S.3 ASSESSMENT FOR THE YEAR ENDING 2011
 AGRICULTURE DEPARTMENT


23
50

PART A (40 MARKS)

This part is basically for project based learning activities.
 Answer all the questions.

- With the help of diagram of a Pig house (Pigsty), Identify the major characteristics of a good one. Give reasons to support the mentioned characteristics. (10 mks)

It should contain feeding containers for feeding the pigs
 It should be separated in different parts in order to keep them according to size
 It should be well ventilated to free circulation
 It should be built in a slant way to prevent water from flowing
 It should be well concentrated
 It should be kept clean to avoid diseases
 It should have enough water for drinking them



Good
05
- Giving examples, why would you advise some one to go for production pig (05 mks),

Its educative hence enables a person to gain more skills
 Its cheap that does not need alot of capital

02
- What advise would you give to some one who wishes to start pig production (support your answers with reasons) (05 mks)

The person should be having enough capital
 The person should be having enough land.
 He should consider market for his produce.
 He should consider bonded labour that is to be applied on the farm.
 He should consider transport for easy transportation of his good products.

04
- What key qualities would you look for while selecting a gilt for breeding purposes? (05 mks)

It should be having the normal number of teats. *what is normal no?*
 It should be easy to breed in case of breed purposes.
 It should be health that is to say free from diseases and pests

01

12.

5. Why is flushing a good practice in pig production? (02 mks)

Flushing does enable the ~~pig~~ pig to gain more energy towards fattening.

6. Why would you recommend early weaning of piglets? (02 mks)

77

7. Why do you think it is important to be able to recognise the signs of heat in a cow? (02 mks)

Its morden to save the pig at the right time.

8. Why does a pig need other feed stuffs apart from grass only? (02 mks)

It need other feed stuffs this because grass only does not contain all food values it need for proper growth.

9. Prevention of diseases and parasites outbreak in a pig house is better than cure, explain how you would put this into practice on a farm? (02 mks)

In case of worms the pigs should be de wormed regularly in case of gigger the pigs should be spread with molthoin on the affected part. The pig sty should be kept clean to avoid easy spreading of disease. The pig should fed on balanced diet to avoid malnutrition. Also the pig should be washed at some times to keep the clean.

PART B: (20 MARKS)

This part attempt one question in this part.

10. (a) Differentiate between milk letdown and milk hold up. (02 mks)

(b) Explain the factors that affect composition and yield of milk from a given cow. (08 mks)

(c) Describe the life cycle of three (3) host tick (10 mks)

11. (a) Explain the factors that affect the normal growth of crops in the garden (10 mks)

(b) List the various ways a farmer may control soil erosion on a gentle slope. (10 mks)

faling
faleg

E N D

MERRY CHRISTMAS AND HAPPY NEW YEAR.

f

APPENDIX D: APPRECIATION LETTERS FROM THE STUDENTS TO ME REGARDING THE RESEARCH PROJECT

to :

THE HEAD OF DEPARTMENT,
 (AGRICULTURE)
 MR - OCHAN MARTIN LUTHER.


RE : SINCERE APPRECIATION FOR MY
 AGRICULTURE TEACHER .
 (MARTIN LUTHER)

I as ^{NAME WITHHELD} as far as teaching is concerned, I am
 so appreciative for what you have done. It has been
 been fantastically done in that, we as students, the concept
 is being ~~done~~ understood both practically and theoretically there
 by helping us to know things physically and mentally.
 In relation to that, this current teaching has
 enabled us to form group discussions which helps us to
 improve on our posing and also helping the low esteem
 students to air out their ideas freely without fear. With that,
 the teaching has been good and wonderfully done by our
 teacher "MR. OCHAN MARTIN LUTHER".

Similarly, another amazing thing is about the project based
 learning. As far as ~~the~~ it is concerned, I thought it was "a joke"
 when our teacher told us to make group ~~extra~~ discussions in order
 to suggest the type of project to carryout. Through our pleasure,
 we chose a piggy unit which is operating now and ever. Due to
 the love he had for us, he decided to invest in his money in
 order to come up a project. We are now able to know the changes
 which take place in the unit, the feeds the eat, mixing ration
 and others thus showing good work done and modern teaching
 mechanism. May the living "God" reward you for what you are.

Relatedly, as far as agriculture is done, we have
 benefited much in acquired skills, knowledge, how to manage, etc.
 I do encourage the current method to continue because it is so beneficial.

MAY YOU LAST FOREVER & EVER !!

Yours sincerely,


MABISWA S.S.S
P.O BOX,
KIBUKU
9/11/2011,

TO THE TEACHER IN CHARGE
OF AGRICULTURE,

Dear Sir

RE: AGRICULTURE PROJECT BASED LEARNING

I humbly thank you for the learning which we have got from you and on to my side the teaching was being done very well because I have got some skills and knowledge from my fellow student in our group discussion and the way you have handling us was very good because I have got many things from you and I have got what you taught us.

According to the project based learning, I have known how to start the project and some ideas which I can also tell some body who is preparing to open the project like pigery rearing or keeping. I have learnt alot about pigery and I know the problem I can face, the factor I consider, how to care piglets, pregnant sow or gilt and I know the sow or gilt when it is on heat and when it is pregnant.

What I am requesting you is to continue with another project like poultry so that we know about poultry rearing like as we know about pigery.

I remain yours faithfully,



This student
really feels
embarrassed.

NABILWA SECONDARY SCHOOL,
P.O. BOX 185,
KIBUKU DISTRICT,
08th/Nov./2011.

TO THE HEAD OF AGRICULTURE
DEPARTMENT OF NABILWA
SECONDARY SCHOOL.

Dear Sir,

R.I. CONGRATULATIONS TO OUR
AGRICULTURE TEACHER MR.
OCHAN MARIIN.

I am writing this letter to you sir appreciating for the good work and spirit you are showing us as senior three class, we are very grateful and glad to see that you tried your level best and told us to form discussion groups and from these we formed our project none other than piggery. And in this project we as students are benefiting and acquiring very much for example we have improved on our vocabulary, we have learnt and acquired skills and knowledge since there is both practical and theory work. And we as students we have ^{got} courage since we are not embarrassed during the discussion work. So as we have acquired the above, now we can ^{be} able to introduce other projects like poultry, cattle rearing etc. So from there I thank you sir very much because you also sacrificed yourself and bought for us agriculture text books and I am encouraging you to continue with the same spirit and help the rest as you have done on us.

Is concerned
of continuity.

NABISWA S.S,
PO BOX 185,
KIBUKU DIST,
08/10/2011.

TO OUR AGRICULTURE TEACHER,
OF NABISWA S.S.

Dear Mr. OCHAN,

REF: APPRECIATION

I kindly encourage you sir for the work you have been doing with us the students of the above mentioned subject.

We have really learnt a lot from our project both practically and theoretically we can now establish a project like the one we are having in school basing to the skills and knowledge we have received at this level.

Never give up sir, continue innovating more projects so that the new students who are expecting to join the above mentioned school should emulate skills concerning of keeping animals and treating them when they ^{have} fallen sick.

May God reward you sir abundantly

Yours faithfully

~~Mattia~~

APPENDIX E: INTRODUCTORY LETTER FROM THE UNIVERSITY

AKERSHUS UNIVERSITY COLLEGE



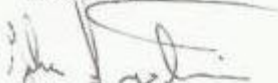
TO WHOM IT MAY CONCERN

RE: Mr. Martin Luther Ochan
Registration Number: HIAK 293165

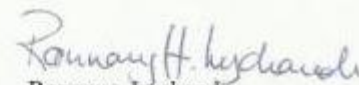
This is to certify that the above reference is a Master's student at Akershus University College Norway. Mr. Ochan is studying Masters in Vocational Pedagogy (MaVP), with main trade in Agriculture. As part of the study program, he is expected to conduct a field research lasting 6 month (June-December 2011) in his home country. His area of study focuses on how teachers can use Project Based learning approach to improve on the teaching and learning of Agriculture at Nabiswa secondary school in Uganda.

Any assistance accorded towards his research effort will be highly appreciated.

Faithfully,


Johan Houge-Thiis
Associate professor
Facilitator

26/05-11
Akershus University College
Faculty of Technical and Vocational Teacher Education
Kunnskapsveien 55
PO Box 423
N-2001 LILLESTRØM


Rønnaug Lyckander
Head of Masters Section