

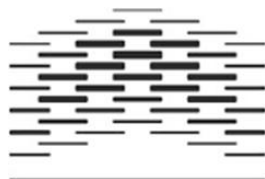
MASTER THESIS

MASTER IN VOCATIONAL PEDAGOGY

AUTUMN, 2016

IMPROVING TEACHING AND LEARNING PROCESS OF PASTRY AND BAKERY  
USING LEARNER CENTERED APPROACHES

Alice Arakit



OSLO AND AKERSHUS  
UNIVERSITY COLLEGE  
OF APPLIED SCIENCES

FACULTY OF EDUCATION AND INTERNATIONAL STUDIES

## **ABSTRACT**

The main purpose of the study was to improve the teaching and learning process of pastry and bakery. The traditional lecture method had dominated it and therefore students had little active involvement in the teaching and learning process. Teachers always found themselves reading notes to the students and the preferred mode of evaluation included theoretical tests and examinations at the end of each semester. Energy conservation as a course unit was the major area of Emphasis. The study employed ideas from a Qualitative research design and an Action Research approach. Through action research, the concerned parties were able to participate actively in the project. The participants evaluated the processes and experiences through reflections done at the end of every phase of the project.

Eight Students of the certificate class of 2015 September intake and two (2) instructors in the pastry and bakery department participated in the project. One employer at Ntake bakery and the principal of the Uganda Hotel and Tourism Training Institute (UHTTI), Jinja provided information though they did not actively take part in the project. Interviews, observations and logs were the data collection tools used. Among those interviewed were, the principal of UHTTI, Jinja and the person in charge of the pastry and bakery department at Ntake bakery (employer at Ntake bakery).

Students, colleagues and I filled logs, made observations and reflections noted every time we had energy conservation lessons. The information therein discussed at the end of every lesson, to pave a way forward for the next phase. To ensure active learning, my students, colleagues and the researcher carried out a project where organic kitchen refuse was recycled into briquettes. Students participated in all the aspects of the project that included planning, execution of the project and evaluation of their efforts. The teachers' roles were to guide students as they critically thought and made decisions to solved problems as they worked. Cakes were baked using heat from briquettes made during the project. The project was one of the ways to ensure active teaching and learning.

The researcher noted all the information and later transcribed it into meaningful data presented in this report. Photographs in this document illustrate some of the key points noted in the field. From the data collected and analyzed, it was evident that learners, colleagues and the key people interviewed had positive remarks about active learning.

They agreed that there was need teach vocational education in a way that enables the learner to interact and communicate with fellow learners, create knowledge, think critically and solve problems especially on their own. There was need for teachers to involve learners actively in the teaching and learning process especially when planning lessons, setting objectives and goals of the lessons and evaluation and assessment of learners' achievements in class.

The project carried out inclined on using kitchen refuse like charcoal remains, banana peelings, waste cassava & wheat flour to make briquettes. To mold the briquettes, we made use of empty spice tins. From the data collected, participants appreciated the idea of recycling kitchen refuse since it improves the ecosystem and saves the trees. Briquettes are eco and healthy friendly since they do not produce smoke as they burn.

During the project, learners worked as a group, shared responsibilities under their student leadership. During the project, students were able to communicate and share knowledge amongst themselves. Students also reviewed their own and colleagues work. After receiving critiques, students were able to improve their work. Students also had an opportunity to evaluate the work of the teachers. This was in terms of their activity in class and ability to let students work on their own.

To ensure ethics in research, participants, the researcher had to explain the participants the importance of the research project. The researcher ensured that the risks involved and the likely outcome of the research project were clear to the participants before involving them in the research project. Participants were also free to choose to participate in the project while those who opted not to participate had their decision respected.

Because of the experiences and reflections got from the project, it is necessary to note that involving learners in the teaching and learning process is necessary for effective learning. There is also need to consider learners' prior knowledge before introducing new knowledge. This therefor means that the teaching and learning environment should have qualities that encourage learners to appreciate their learning. This also ensures that learners are responsible for their own learning.

## **DEDICATION**

I dedicate this study to my dear son Jesse Levi Mumbya.

## **ACKNOWLEDGEMENT**

I wish to congratulate myself upon achieving this great milestone in my academic and professional career. It was a journey worth taking.

In a distinctive way, I would like to extend my wave of thanks to the Uganda Hotel and Tourism Training Institute, Jinja for not only allowing me carryout an action research project from their premises but also participated in the project. I will forever be grateful to you.

In addition, I would like to acknowledge students of pastry and bakery, certificate class of 2016 (September intake) for actively participating in the action research project.

With great love, I extend my deepest appreciation to my dear parents, brothers and sisters for their love and at most encouragement in bid to achieve this academic and professional milestone.

I extend my wholehearted appreciation to my dear Husband and son who bore my absence from home to pursue my career; I will forever cherish and appreciate you.

I also acknowledge the efforts of; Jalia, Emmanuel, David, Ivan, Richard and Bruno for their guidance especially during group discussions.

I also would like to express my research supervisor Prof Jan Stålhane for his guidance during the write up process of this research report.

## Table of Contents

ABSTRACT .....	i
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
LIST OF FIGURES.....	vii
LIST OF TABLES.....	viii
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background of the Study .....	1
1.2 Uganda’s Current Education System .....	5
1.3 Personal and Professional Back ground.....	7
1.4 Problem Statement .....	10
1.5 Explanation of the Problem Statement.....	10
1.6 Objectives of the Study .....	11
1.7 Organization of the Report.....	11
CHAPTER TWO: DIDACTICAL RELATIONS MODEL .....	14
2.1 Overview.....	14
2.2 Pupils’ Learning Resources .....	15
2.3 Pedagogical Frame Work/ Conditions and Scope .....	17
2.4 Goals and Objectives.....	19
2.5 Educational Content/ Subject Matter.....	20
2.6 Learning Process .....	21
2.7 Evaluation .....	23
2.8 Summary of Chapter two (2).....	24
CHAPTER THREE: THEORY .....	25
3.1 Overview.....	25
3.2 Vocational Education .....	25
3.3 The Teaching and Learning process.....	27
3.4 Briquette making.....	34
3.5 Summary of Chapter Three (3).....	37
CHAPTER FOUR: METHODOLOGY.....	39
4.1 Overview.....	39
4.2 Research Design.....	39
4.3 Action Research Approach .....	39
4.4 Sample population .....	41
4.5 Data collection instruments .....	42
4.5.1 Interviews:.....	42
4.5.2 Observation.....	44

4.5.3	Logs.....	45
4.6	Validity and Reliability.....	46
4.7	Ethical Considerations.....	48
4.8	Challenges.....	51
4.9	Summary of Chapter Four.....	52
5.1	Overview.....	53
5.2	Phase One: Planning.....	54
5.3	Phase Two: Preparing Raw Materials.....	61
5.4	Phase Three (3): Production Process of briquettes.....	69
5.6	Phase four: Cooking with Briquettes.....	75
5.7	Phase Five: Evaluation.....	78
5.8	Summary of Chapter Five.....	82
<b>CHAPTER SIX: DISCUSSION OF FINDINGS.....</b>		<b>83</b>
6.1	Overview.....	83
6.2	The Teaching and Learning process.....	84
6.3	Briquette making.....	92
6.4	Summary of Chapter Six.....	94
<b>CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS.....</b>		<b>95</b>
7.1	Conclusion.....	95
7.2	Recommendations.....	97
<b>REFERENCES.....</b>		<b>a</b>
<b>APPENDIX A.....</b>		<b>f</b>
<b>APPENDIX B.....</b>		<b>g</b>
<b>APPENDIX C.....</b>		<b>h</b>

## LIST OF FIGURES

<i>Figure 1: Uganda's Formal Education System</i> .....	7
<i>Figure 2: Didactical relations model</i> .....	14
<i>Figure 3: a) shows students during the project while b) shows students before the project was introduced</i> .....	23
<i>Figure 4: Shows one of the students summarizing what we had discussed in one of our meetings</i> .....	59
<i>Figure 5: Shows students preparing raw materials for briquettes</i> .....	62
<i>Figure 6: Showing students as they made briquettes and some of their first briquettes they made</i> .....	70
<i>Figure 7: Showing how students used briquettes to bake cakes</i> .....	75



## **LIST OF TABLES**

Table 1: <i>Copy of the Log used to record Learning Activities</i> .....	46
--	----

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Teaching vocational education requires use of the most appropriate methods especially those that actively involve learners in the teaching and learning process. The effectiveness of all education systems depends critically on the quality of teaching and learning in classrooms, workshops, labs and other spaces in which education takes place. The real answers to improving outcomes from vocational education lie in the classroom in understanding the many decisions teachers take as they interact with students (Lucas, Spencer, & Claxton, 2012, p. 13). Teachers therefore need to use the right instructional methods that enable students plan, actively learn and evaluate their own learning.

My desire and interest in teaching is to see my learners actively involved in the teaching and learning process and to ensure that they collaborate during learning. To ensure active and collaborative learning, my students, colleagues and I engaged in an action research project where kitchen refuse was recycled to generate briquettes to bake cakes. The main purpose of the action research project carried out was to improve the way of teaching and learning of energy conservation as a course unit. In its present use, action research is one of the few research approaches that embrace principles of participation, reflections, empowerment and emancipation of people and groups interested in improving their social situation or condition (Berg & Lune, 2012, p. 259).

According to Cochran-Smith & Lytle in (Zeichner, 2001, p. 279) “action research alters teachers talk about students from a focus on students problems to an emphasis on student resources, accomplishments, and leads to more learner-centered classrooms”. Pedagogical action research involves studies that include systematic collaboration in planning, carrying out, evaluation and critical analysis of teaching and learning process, with the aim of improving and documenting new knowledge of teaching and learning processes in school and work life Hiim, 2003 in (Hiim, 2007, p. 100).

Reflecting on the above theories about action research, I developed a desire to carry it out with my students and colleagues at the Uganda Hotel and Tourism Training Institute (UHTTI), Jinja. Through the action research project, methods of teaching would improve which would in turn improve the quality of our graduates. This therefore means that students are trained using the most effective methods in order to acquire the necessary knowledge and skills needed in the world of work and the communities where they live.

Across the world in recent years, Vocational Education Training (VET) is expected to meet the demands of the rapidly changing global environment. This means that we have to find different ways to support the vocational learning of people already in the workplace, as well as those who are about to join it (Hillier, 2009, p. 1). The international and comparative study of vocational education in English and emanating from Britain has proceeded apace since 1980s, though it has been largely dominated by sociological and economic concerns, (Clarke & Winch, 2007, p. 3).

According to Calder and McCollum (1998, p. 3), the expansion of vocational education and training has thus been accompanied by qualitative shifts in its nature. A key theme in debates on vocational education and training revolves around the need for a workforce that can cope with changing demands of the international economic environment. A country's workforce is seen as a crucial success factor in its international competitiveness, and vocational education is seen as crucial in the development of multi-skilled workforce.

In my own perspective, to produce graduates that are multi-skilled, there should be more emphasis laid on the way the training is undertaken. Among the main task of schools is to prepare students for the world of work, this means that teachers have to look for best ways to train and prepare students for the future work places. This includes choosing appropriate teaching methods and teaching environment. "Active methods in teaching and learning have been requested in many educational debates at national and international levels" Corno; Stern & Huber in (Niemi, 2002, p. 764).

According to Chickering & Camson, in Bonwell and Eison (1991, p. 5), Analysis of the research literature however suggested that students must do more than just listen. They must read, write, discuss or be engaged in solving problems. Most important to be actively involved, students must engage in such high order thinking tasks as analysis, synthesis and evaluation.

In the Netherlands for example, vocational educational programs have to be competence-based from 1 August 2010. As a consequence, the traditional out-of-context practical and theoretical lessons are more and more replaced by internships and workplace simulations (WPS), (Jossberger, Brand-Gruwel, Boshuizen, & van de Wiel, 2010, p. 416). WPS are authentic learning environments at school, which should attract, inspire and challenge students to acquire knowledge, (learning) skills and attitudes relevant for vocational education. The idea is that students work independently and self-direct their learning Teurlings et al; Vrieze et al, in (Jossberger et al., 2010, p. 416).

In their discussion on learning models, Clarke & Winch in (Brockmann, 2007, p. 5) “suggest that in England VET relies largely on inductive learning whereby people are expected to generalize from their experience, given the minimal theoretical knowledge input”. In Germany, France and the Netherlands, the learning process is deductive as people draw on the body of taught theoretical knowledge to inform their practical work.

However, as they reflect on their experience, they expand their body of knowledge following the inductive model (Brockmann, 2007, p. 5). Policymakers and other stakeholders in Africa have viewed and recommended a transformation of vocational education processes that would form skills in ways that will allow individuals to find their riches in the world of work in relation to what kinds of skills are demanded African Union (AU): Lutalo-Bosa in (Tusiime, 2015, p. 101).

With specific reference to sub-Saharan Africa, several strategies and transformations have taken place to promote acquisition of skills and knowledge with an aim of making learning and teaching more relevant to society’s needs and for sustainable development. Most governments have attempted to strengthen and revitalize vocational education at primary, lower secondary and upper secondary levels AU in (Tusiime, 2015, p. 101).

In the Ugandan context, vocational education reforms have taken place with the ministry of education drafting a 10 year (2011-2020) strategic plan (BTVET Act 2008) titled “skilling Uganda”, in the department Business Technical and Vocational Education and Training (BTVET). The act denoted a paradigm shift for the skills development in Uganda. The BTVET department needed to transform from an educational subsector into a comprehensive system of skills development, productivity and growth instead and also to create employable skills and competences relevant in the labour market instead of educational certificates (MoES, 2011, p. 7).

Although the BTVET Act is in place, UNESCO-UNEVOC (2014, p. 11) noted that there are no programmes available for under/unqualified TVET teachers and trainers and the current capacity for teacher training was insufficient to cater for the huge demand of inservice training to meet the planned upgrading in the BTVET system. According to UNESCO-UNEVOC (2014, p. 11), TVET teachers and trainers in private institutions are mainly drawn directly from graduates of technical institutes and polytechnics who have rarely had industrial experience or pedagogical training.

With specific refernce to the aims and objectives of vocational education in Uganda and the UHTTI motto, “skills excel”, it is evident that they are all focussed on the quality of the graduates and the skills obtained by the end of any vocational course. Every year students are admitted to UHTTI, Jinja for various diploma and certificate courses for a period ranging from one to three years. These include but not limited to pastry and bakery and hotel management. The institute has been in existance since 1989, as a tourism training institute formally at fairway hotel in Kampala. In 1994 it was shifted to Jinja since there were more tourist attraction features in Jinja and besides the government had acquired a bigger space with a hotel facility (crested crane hotel) which had started earlier in 1955.

From the interview with the principal of UHTTI, Jinja, it was noted that since 1989 most instructors in the institute had been sourced from the hotel industry and therefore had little or no pedagogical training. Today its quite hard to find a hotel instuctor with both pedagogical and hotel knowledge.

Most instructors at the institute have hotel knowledge but lack pedagogical skills and others have pegadogical skills but with little hotel experience. Those with pedagogical training still use lecture method to teach. Despite the fact that UHTTI, has instructors who have pedagogical training, they do not also practice learner centred approaches of content delivery. These instructors occassionally read notes to students and students have no chance to evaluate their own work. This was revealed from the study we carried out as our first project at Oslo and Akershus University College of Applied Sciences (HiOA). The title of the project was (MAYPH 4100, challenges of implimenting vocational education in Uganda).

Teacher centered methods of teaching are very common in most schools in Uganda. To some extent, the teachers may not have had good pedagogical training since they have also gone through the same education system which does not emphasize learner centred approaches. “Research supports the concept that most teachers teach the way they learn” Stitt-Gohdes in (B. L. Brown, 2003, p. 3). Tusiime (2015, p. 107) agreed that the formal vocational systems in Africa aim for the most part to equip graduates with certificates for progression in the learning system. They become managers and not scientifically educated, skilled workers who can practically meet the ever changing needs in their local societies. As a result students and teachers work very hard to ensure that students can get good grades to be put on the certificates regardless of the skills and knowledge acquired.

Formal education system in Uganda is not any different from other African countries where educational certificates are more important than the skills and knowledge acquired. It follows that teachers spend much of the time required for teaching to prepare students to pass examinations and tests. Reflecting from the above and my own experiences as a graduate teacher in a vocational institute and my reflection from the Norwegian education system, I feel my students need to be actively engaged in the planning, learning and evaluation of their own learning. They need to be responsible for their own learning. This therefore means that there must be a gradual and consistent change in the classroom environment; the way I teach, deliver subject content and evaluate the students’ outcome.

## **1.2 Uganda’s Current Education System**

With the beginning of missionary activity, western education became an important part of the process of conversion to Christianity. Most of the missionary groups required that the individual be able to read and some cases to write before being accepted as a convert (Scanlon, 1964, p. 7).

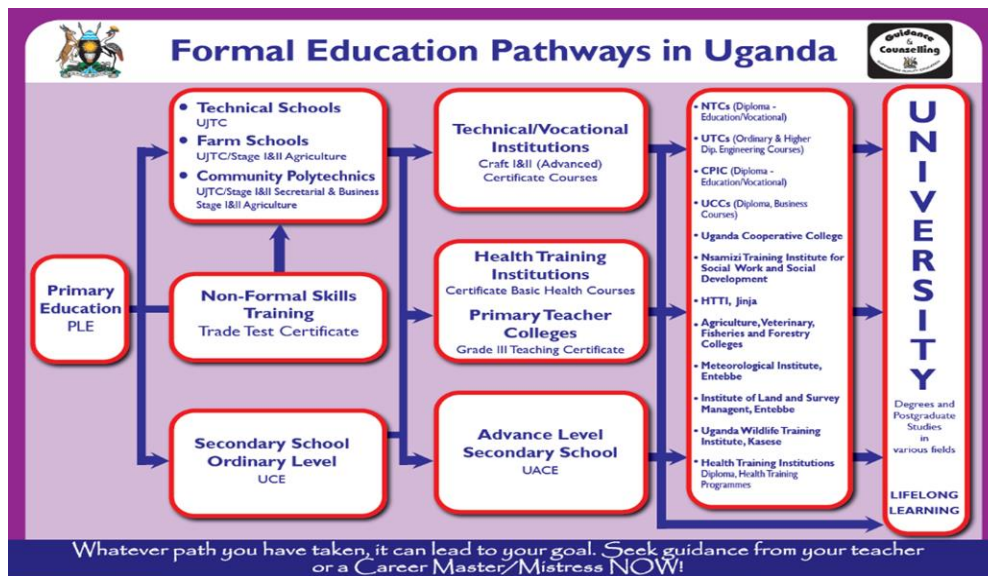
There are four levels of education in the Ugandan formal education system. These include pre-primary, primary, secondary and technical, vocational and business education and university education. Typically, education in Uganda is acquired through multiple approaches including the formal, non-formal and informal systems. The constitution in operation mandates Government to be responsible for leading in provision of education. However individual, private sector and Non-Governmental Organizations (NGO) are all encouraged to join government to educate Ugandans Ministry of Education and Sports, (MoES, 2001, pp. 9-10).

The missionaries introduced formal VET in Uganda, in the late 1870s. VET training centers were set up at each church mission center to train Ugandans who would fulfil the needs of the missionaries especially evangelism. They also trained technical skills because they needed people to help them with works that required technical knowhow, Ssekamwa and Lugumba in (Kyarizi, 2012, p. 8).

The system of formal education in Uganda starts with primary schooling, which takes seven years. All those who complete the primary school cycle are expected to join secondary school, which takes four years at lower level known as Ordinary (O'level), and two years at higher level known as Advanced A'level (Advanced level) or join the technical schools which take three years at the lower and 2 years at the advanced level. To proceed from one level to another, the students must pass the nation-wide standardized tests (Okou, 2002, p. 1).

There are also options of joining vocational institutions after every level but most students prefer to continue with the academic route. There still exists a disparity between technical/vocational education and general academic education with no formalized linkages but it is now possible for students who go to vocational or technical institutions to join the universities at some stage in their career if they want (Okou, 2002, p. 7). Today the responsibility of monitoring and regulating vocational education in Uganda is under the ministry of education and sports (MoES).

From the national perspective, the aims and objectives of technical and vocational education in Uganda are: To stimulate the technical growth of students in order to make them productive members of the community and to produce craftsmen, technicians and other skilled manpower to meet the demands of industry, agriculture, commerce and the general labor force (Okou, 2002, p. 3). Okou (2002, p. 5) however noted that with such good objectives and aims, the supply and quality of teachers is still a big problem with most teachers being undertrained. Good technical and vocational training requires instructors who have technical skills, industrial experience and pedagogical skills. Okou (2002, p. 5) further noted that if teachers are poor deliverers of their content, they are likely to produce poor graduates with low motivation and confidence to work.



Source <http://www.education.go.ug/files/downloads/Poster.pdf>:

Figure 1: Uganda's Formal Education System

### 1.3 Personal and Professional Back ground

I am a graduate teacher with professional and vocational interests linked to Home Economics. I currently teach energy use and conservation at a hotel school, UHTTI in Jinja. As a teacher trainee for three years at Kyambogo University, I learnt several methods of teaching including those where the teacher had all the authority in decision making regarding what to teach, objectives of the lessons taught among others and other teaching approaches where learners would be involved in the preparation of the lessons, decision-making as well as ensuring democracy in class.

According to Kerka (1997, p. 2), "the behaviorialist approach of teaching has dominated education, which the teacher disseminates selected knowledge, measures learners passive reception of facts and focusses on behavior control and task completion". While at Kyambogo University, the teacher usually drew his/her lesson plans, developed objectives and content without involving learners yet they were the main beneficiaries. The methods of teaching, instructional materials and modes of evaluation too were developed and chosen by the teacher.



Most of the teaching emphasized training in pedagogy than it was on hands on training and skills acquisition. The mode of assessment was through end of semester examinations that could only encourage reproduction of teachers' work. This only encouraged passive learning which has a disadvantage as noted by Berryman (1991, p. 2) that "passive learning places a premium on reproducing the "right answers" to the teachers or test questions but often without real learning".

I joined Kyambogo University with prior knowledge in food and nutrition that I had studied as part of my subjects in high school. This further gave me more experiences in the hotel industry. While at Kyambogo University I met with other students from the hotel industry whose experience in their field of work further increased my interest and desire to pursue my professional career as a vocational teacher.

Before I joined UHTTI, Jinja, I first taught Home Management, Food and Nutrition in in both lower and upper secondary school respectively in Uganda. While teaching at the secondary school, I tried to use learner-centered approaches of teaching and learning. However, the attitude of the school administration was not good towards my mode of teaching. This was partly because I gave learners freedom to choose what to study, when to study and the mode of evaluation. The school administration was more concerned about the grades that the students got at the end of secondary level (UCE and UACE) than the skills they obtained.

The head of department tasked me to prepare schemes of work and lesson plans that I handed in for approval before students reported to school. I also had to prepare lesson notes that I was to read to students throughout the year. The Director of Studies (DoS) who at that time had little information about the teaching and learning of Food and Nutrition had to approve them before teaching would start. All along, I believed that that was the best way to teach owing to the many advantages that the school administration attached to it. It was not by surprise that when I started teaching at UHTTI Jinja, I taught the same way. I could draw my lesson plans according to the timetable and the syllabus that the head of department gave me.

I also decided the teaching methods, instructional materials, subject matter, objectives and aims of the lessons and the mode of evaluation of learners' competences. I occasionally read out notes for my students and could not give my students time to evaluate their own efforts in class. I attribute this to the professional training that the secondary school gave me.

While at UHTTI, Jinja I got an opportunity to come and further my skills and knowledge in (MA) vocational pedagogy in Norway. As part of my learning experiences, I got more information about student-centered approaches of teaching and learning.

With this approach, I noted with keen interest the importance of involving my learners actively in the teaching and learning process. I also learnt that it is necessary to help my students learn from their colleagues. As noted by Grabinger and Dunlap (1995, p. 9), learning is a collaborative process. Students learn not solely from experts and teachers, but also from each other. They test ideas with each other and help others build, elaborate and refine knowledge structures. They further emphasized that learners are constructors of knowledge in a variety of forms. They take an active role in forming new understanding and not just passive receptors of facts from teachers.

As a reflection from the above experience, I developed a desire to change my professional practice gradually from the traditional lecture methods to more learner centered teaching and learning. Since I teach energy use and conservation, we agreed to work on a project that would involve both the teachers and the students as active participants. To emphasize Democracy, students participated in various activities that included planning, decision-making, choice and preparation of learning materials and assessment of their learning.

They also had a chance to evaluate the teacher, something that was very new to them and the institute. This was partly because of the education system they had gone through during their previous study years, where only one body (UNEB), examines all the students. To build this research, the experiences gained from the previous projects carried out throughout my course of MA (Master of Vocational Pedagogy) and those that I gained from the visits to Skedsmo and Esterstad videregående Skole have been of great importance. I have tried out Implementation of the learner-centered approaches in my previous project (MAYPH 4300) with a different certificate group.

However, due to time factor and less experience from the researcher, learners did not have enough time to evaluate their learning and the teachers teaching abilities. This has therefore created a desire to further my research in the same area. Reflecting on the background of the study and my own background, I draw my conclusion that; despite the fact that I was trained in a way which did not engage learners in the teaching and learning process, it is necessary for me to train my learners in a way which encourages them to work actively.

In order to achieve the main objective of vocational education in Uganda, it is necessary to teach vocational students in way that depicts their future work places. With this, I therefore introduce my problem statement.

#### **1.4 Problem Statement**

*How can teachers use learner-centered approaches to improve the teaching and learning process of pastry and bakery?*

#### **1.5 Explanation of the Problem Statement**

With Learner centered approaches, I mean putting learners at the center of the teaching and learning process. I feel learners' prior knowledge, skills, and involvement in the teaching process are necessary in order to produce a good vocational graduate. In this regard, I feel learners need enough time to work on their own and be able to share knowledge and skills with their colleagues. I feel learners have a wealth of knowledge that they are willing to share with others if only given the right platform.

According to Koschmann, Kelson, Feltovich, and Barrows (1996, p. 90) an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains.

From this perspective, I developed a desire to change my way of teaching gradually to active learning. Many times, I have found myself making objectives for my learners, making and reading for them notes in class and they do not have the opportunity to evaluate their own work. The most noted disadvantage with this kind of practice. Being a teacher whose professional interest is in vocational skills acquisition, I chose to change my teaching methods gradually from the traditional teacher centered approaches to more learner-centered approaches.

Pastry and bakery is a course at UHTTI, Jinja. Students train to prepare and cook pastry products like cakes, bread, biscuits. Its main objective is to equip students with knowledge and skills for both formal employment and self-employment. Students admitted to this course are mature (above 20 years) and are willing to learn. The course normally takes one year at school after which students start to work.

Reflecting on the above and as a way to make learning more active, we agreed to carry out a project where we recycled kitchen refuse to generate an energy source that can be used to bake cakes at UHTTI, Jinja. Recycling kitchen refuse was not only important in disposing of the kitchen refuse but also creating another venture where students could earn a living after school.

## **1.6 Objectives of the Study**

The study was guided by the following objectives generated from the problem statement. Objectives were also utilised during selection of data collection tools, literature selection and in the discussion of the findings.

1. To integrate learner centered approaches in the teaching and learning process of Energy Conservation of bcpb/sept class;
2. To make use of kitchen refuse materials to facilitate active learning of Energy Conservation;
3. To assess the impact of learner centered approaches to the teaching and learning process of energy conservation.

## **1.7 Organization of the Report**

I have presented the report in seven chapters which include introduction, didactical framework, theory, methodology, data presentation, discussion of findings and conclusion and recommendation chapters. Chapter one (introduction chapter) presents my personal and professional background as a trainer, trainee and as a research student. It also presents the theoretical background to the study. It also presents the problem statement, explanation of the problem statement. In the problem statement and its explanation, I have discussed the need to involve my learners actively in the teaching and learning process. It has also showed the need to improve my practice as a vocational teacher. It also presents the Ugandan formal education system and information about vocational education in Uganda and the objectives of the study.

Chapter two (2) presents the (Hiim & Hippe, 1989) didactical relations model. It also shows how I applied it in my research in order to implement my project and to answer my problem statement. It shows the relationship between learners' resources, pedagogical framework, teaching and learning process, educational content, evaluation and goals and objectives of teaching and learning process. It also presents information on how to recycle kitchen refuse to generate useful products (briquettes). This chapter also presents how we conducted the teaching and learning process and most importantly how students generated their own learning experience and shared their prior knowledge. It also shows the need to evaluate students work based on the goals and objectives set as a group.

Chapter three analyses the different concepts and theories related to teaching and learning process, knowledge creation in relation to vocational education. It also contains only those theories that I found useful to my research topic and problem statement. It also provides information about the expected outcome of vocational education. It also includes the databases, websites and other sources of information that I consulted before and during the write up of this project. In this chapter, I also present theories that explain the need to recycle kitchen refuse in order to generate energy.

I have also discussed the importance of active learning in relation to the student and the teachers. I also discussed the importance of active learning to a student while still at school and after school. The roles of learners and teachers in active learning were also of great importance in this chapter. This chapter has presented the raw materials, process and importance of briquettes in Uganda and the societies around. These may include being eco-friendly, solving the problem of refuse disposal and being a cheaper and affordable alternative source of energy to the community.

Chapter four (4) presents the research methodology including, research design, research approach, data collection techniques, sample population, validity and reliability, ethical considerations. Under research design, I have described the qualitative research design and its importance. Since it was an action research project, I have also described in detail why I chose to use action research in particular. I also present the importance of doing action research from the recommendations and guidelines of different writers.

It also presents the different data collection tools utilized during the project. These include interviews, observations and logs. I have also discussed Information about the participants in the project with reasons why they participated. This chapter also presents information on strategies employed to ensure reliability and validity of the research results/ findings without overriding the ethical considerations of the participants. It also presents more information about ethics in action research.

Chapter five (5), presents the findings from the field in phases. Phases include planning, preparation of raw ingredients, process of making briquettes, cooking with briquettes and evaluation of the entire action research project. In this chapter, I have presented findings with reference to the problem statement and the objectives of study. Findings presented here include a description of how the events in the project occurred. It also includes a brief discussion of the findings with reference to the literature discussed in chapter three. It also presents the views of the participants about the main issues in the problem statement. These include learner centered teaching and learning, making of briquettes I relation to vocational education in Uganda both at school and after school.

Chapter six (6) presents the detailed discussion of the findings with generated evidence in relation to the problem statement and with back up of theories discussed in chapter three. The key areas of discussion include the issue of active teaching and learning especially using project basing learning. Another issue under discussion was briquettes and their use in the society. I have discussed the findings with reference to already existing theories.

Chapter seven (7) presents the conclusion, recommendations made with reference to the information obtained from the observations, interviews and reflections conducted during the project. The main purpose of the suggestions includes but not limited to improving the future of the teaching and learning process of pastry and bakery. The recommendations also include suggestions intended to improve energy use in bakeries as well as prevention of deforestation in Uganda at large.

**CHAPTER TWO: DIDACTICAL RELATIONS MODEL**

**2.1 Overview**

In this chapter, the researcher made use of the information from the didactical relations model (Hiim, 2011, p. 20), to analyze her own teaching and learning process. The model provides teachers and students with a set of common concepts, which can make it easier to cooperate in teaching and learning process. The main point of the model is to contribute to a systematic reflection on teaching and learning and to development and change of such processes (Hiim, 2007, p. 99). She also emphasized that the fundamental basis of content in this education is the practical professional work rather than traditional theories and disciplines.

With this in mind, I chose to apply the didactical relations model in my teaching and learning process. It also shows how the different factors in the teaching and learning process are related and how each factor affects or influences the other. Much as some factors in education may be present, it is necessary to know how important each factor is and how modification of one factor causes change in the teaching and learning process.

I found it very necessary to use it in my research because it gave me a wide reflection about my learners and the factors surrounding their learning. I also realized that once one factor is modified, its impact affects and creates greater changes to the entire education system.

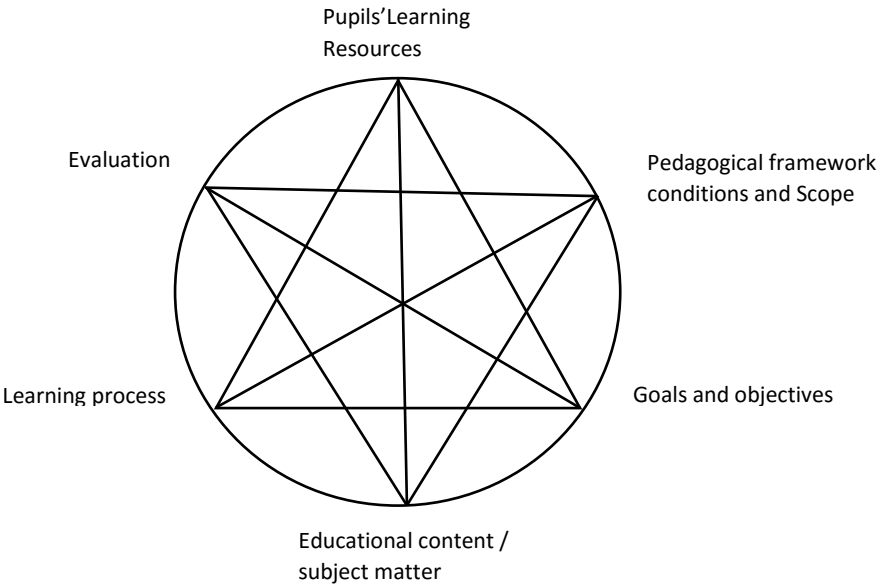


Figure 2: *Didactical relations model*

Source: Hiim (2007, p. 99)

## **2.2 Pupils' Learning Resources**

Learners learning resources included teachers who are determined to help students to acquire the necessary knowledge and skills. Teachers in the pastry and bakery department have undergone pedagogical training at the degree level in Vocational studies especially in Home Economics. They have been teachers for quite a number of years in the Hotel school. I chose to work with them not only to facilitate learning but also to work as consultants. Other roles of the teachers included guiding learners during observations and facilitating the teaching and learning process. This is because the teachers have experiences in preparation of students for various tasks linked to the world of work.

Throughout the project, eight (8) students from the Basic Certificate in Pastry and Bakery (BCPB) class participated. BCPB is a one year (two semesters) course at UHTTI, and students train in skills in pastry and bakery management. Amongst the eight students, five (5) were female and three (3) were male. All these students were mature and were between ages 20 and 25 years.

Theories or perspectives on adult learning such as Andragogy make a number of assertions about the characteristics of adults. [They noted that] adults need learning to be meaningful, they are autonomous, independent and self-directed, prior experiences are rich learning resource, their readiness to learn is associated with a transition point or a need to perform a task. Their orientation is centered on problems not content, they are intrinsically motivated, their participation in learning is voluntary (Draper,1998 ; Sipe, 2001; Tice, 1997; Titmus, 1999) in (Kerka, 2002, p. 3).

As learners learning resource, the school arranged a study trip to Ntake bakery. It is one of the leading bakeries in Uganda. While in the bakery, students obtained knowledge about the different energy sources and ingredients used in the factory. It was also necessary for the students to make a comparison between what taught at school with what was at their future work place. Ntake bakery produces most pastry and bakery products like bread, cakes and biscuits in most confectionary shops countrywide. It is also one of the prominent employers of the graduates from the pastry and bakery department of UHTTI, Jinja. We found it very necessary to expose our students to the employers so that students could get the right feel of how their future work place.



All the students attained lower secondary level certificate but the years at which they sat the end of lower secondary (UCE) exams varied with some of them claiming to have spent about two years out of school. Some two were direct entrants from upper secondary (A'level). When asked about why they joined the vocational school instead of university, their answers included no money to continue with education and those who had the money to continue to high school, did not score enough grades for them to join the university. Therefore, they had to join the vocational school as the last resort. According to Okou (2002, p. 2) "Technical/vocational education has historically been considered education for those students who fail to make it through the straight path, i.e. primary to secondary to university".

These students have undergone industrial training for three months in the world of work and after this semester. At the time of the project, they were attending their last semester of study at UHTTI, Jinja and they join the world of work. They therefore became the best choice of participants for this project. When I tried to ask them about what they would do after school, most of them wanted to start up their own bakery shops to generate more income especially the two female students who fear to leave their children to work away from home.

The students who "failed" the upper secondary are little reserved and did not feel free to express themselves in class. Some of them work at night and therefore find it hard to concentrate in class especially if they are not studying practical lessons. If a lecturer reads for them notes in class, they sometimes dodge because they can easily copy the notes later and reproduce it in an examination.

Other resources that facilitated the teaching learning process included Organic kitchen waste like banana peelings, mixture of waste cassava flour and wheat flour and some waste charcoal dust. These were collected from the hotel kitchen and others were collected at the end of other practical lessons. As part of their learning, students had a task to recycle kitchen refuse into briquettes to solve the problem of refuse disposal. According to Sear and Reagin in (Placklé et al., 2014, p. 112) "learning is facilitated when students are engaged in problem-centered instructional design in which skills are taught in the context of real-world problems. Working in small groups can enhance problem-solving performance and learning".

Since the entire project rotated around recycling kitchen refuse, we realized that buying molds would be expensive and would not solve the immediate refuse problem in both our homes and the practical room too. To ensure disposal of all kitchen refuse, students made use of empty spice tins to mold the briquettes. A saucepan with a tight fitting lid acted as our oven (we had planned to use a special oven which uses briquettes unfortunately it was not possible to acquire one at that particular time. Therefore, we had to improvise with the saucepans that played quite a god job).

Charcoal stove; this provided the area where the briquettes burnt to release energy that baked the cakes. Cake mixture; this was obtained from their practical lesson that they had learnt earlier in the day and saved it to be baked using heat from briquettes.

Internet was also another resource that we used to get more knowledge on how to recycle organic kitchen refuse in addition to the information obtained from the school library. This also supplemented the information that the researcher had from her one-week training in briquette making and the information that the two students had about briquettes. Throughout the project, my student shared knowledge and responsibilities and everyone felt accountable for the entire process. This made learning quite interesting and lively.

### **2.3 Pedagogical Frame Work/ Conditions and Scope**

The school has classrooms where daily lessons take place. Students can do their private reading in these rooms and some times go to the library for their private reading and consultations although the later is not very common. The school also has a computer laboratory with internet access where students can find information. Teachers prefer to use lecture method to teach most of the lessons and occasionally read notes to the students in class. Therefore the teachers interests play a big role in deciding what to teach and they ways of evaluation. According to Barr and Tagg in (Michael, 2006, p. 160) in teacher centered approaches, what matters most in determining what is learned is what the teacher does in the lecture hall. It is of course, understood that what students do in response to the teachers' lectures matters but the focus is on the teacher in front of the classroom.

However, Berryman (1991, p. 2) noted that control over learning in the hands of the teacher undercuts the students' development of cognitive management skills, including goal-setting, strategic planning, monitoring, evaluating and revising-capabilities. Students develop no confidence in their own ability to learn or in their own sense making. Their abilities and opportunities to learn from experience are highly constrained.

However, Kerdpol (2016, p. 134) suggested that to be effective learners, [one must]; 1) perceive information, 2) reflect on how it will impact some aspect of one's life; 3) compare how it fits our own experiences and 4) think about how this information offers new ways for us to act. Learning requires more than seeing, hearing, moving or touching to learn. We integrate what we see and think with what we feel and how we behave.

This therefore means that the methods of teaching should encourage a student to apply all or most of the above suggestions in order to achieve much from their education. The school operates a demonstration kitchen where practical lessons are conducted. There are some equipment in the demonstration kitchen which include; ovens and cookers which are powered by both electricity and gas. It also has some small equipment like sauce pans, mixing bowls, whisks among others. The demonstration kitchen however doesnot have an oven or cooker which uses the local fuel (fire wood and charcoal) available in the society where my students live. In cases where electricity and gas supply is not enough the practical lessons are paused until the issue is resolved. However at the time of our project, the school had not yet procured the equipment required. We had therefore to improvise with what was available.

Each department has its academic activities aligned in the timetable. The time table indicates the actual time stipulated for a particular course unit per week and later on for the entire semester. All teachers are expected to follow the time table to ensure that the planned curriculum of the ourse unit is covered. For this particular course unit (Energy conservation) we had two contact hours a week. To effect learner centered learning through project work, it was necessary to create more time in addition to what was planned by the school.

Since the demonstration kitchen did not have the equipment required and the considering the nature of the project, we opted to use the compound for demonstrations and part of the kitchen for storing the products. This did not only create a big space for our work but it also created a free mind for students away from the classroom stress. It also made my students create more knowledge and come out of the syndrome of copying notes in class and also made them learn in a natural environment with plenty of natural air.

It should also be noted that that the demonstration kitchen doesnot have a provision for cooking using the local fuel available therefore we had to use the space outside the kitchen.

## **2.4 Goals and Objectives**

To emphasize students' participation in all teaching and learning activities, we had to set the objectives and goals of the project together with students. At first, they thought it was not a normal thing since they had got used to the old system of doing work but later started enjoying the activities. The goals for the project were set together with the students. These guided us from the beginning of the project to the end. The major goal for the project was to use learner-centered approaches to improve the teaching and learning of pastry and bakery at UHTTI, Jinja.

While setting the objectives to guide the project, the school vision and mission, played a very important role. The school vision states as “To be the leading hands on trainer in Uganda of highly skilled workforce for the hospitality industry” and the school mission states that “to produce highly skilled and competent workforce for the national and international industry». The goals and objectives set to guide the participants during the project had to reflect the values of the school. The objectives also had to be in line with the needs of the learners, considering their ages and prior knowledge especially about briquette production. Students also had to be fully responsible for their learning evaluation of their achievements. This therefore formed the basis for the inclusion of learner centered learning approaches in their learning process.

In the same context, Knowles in Macaulay, Cree, and Macaulay (2000, p. 6) in learner centered concept of learning , knowledge is not given but actively acquired and interpreted by the individual. In this concept transfer of learning is facilitated by creating a suitable climate for learning, acknowledging that feelings and attitudes of the learner as important as their cognitive strategies in dealing with the learning task, enhancing their capacity for self-direction and allowing time for reflection and making connections between prior and present experiences.

The other objective of the study was to empower students to work on their own without much supervision from the teachers. In this regard, the teacher delegated the role of organizing the students and controlling the discussions that students held to the student leader. As noted by E. G. Cohen and Lotan (2014, p. 2), delegating authority does not mean that the learning process is uncontrolled, the teacher maintains control through evaluation of the final group product and the process by which the students arrived at the final product.

## **2.5 Educational Content/ Subject Matter**

Since the curriculum was already set, we had to follow it but only change the mode of delivery of the selected content. We realized the content was relevant but the methods of teaching were still lacking since teachers used to read notes to students that rendered them passive in class. As noted by Koschmann et al. (1996, p. 90) an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains.

Energy conservation as a course unit has several topics that include, “strategies to use energy reserves sustainably”. This topic requires students (stipulated in the curriculum objectives) to be able to explain how energy is produced from biomass such as fossil fuels, wood, saw dust and husks, animal droppings vegetable and fruit peelings. It also requires students to carry out mini projects around school to produce energy that could bake. They could also visit resourceful centers like biogas plants and see what exactly takes place there.

However, the mode of teaching that particular content did not encourage sharing knowledge since every student worked hard to attain the best grade at the end of the course regardless of the quality of the skills and knowledge acquired. According to Bruner (1990) in (Aakre, 2009, p. 90), “learning is also a social process including communication and interaction with others”. This further explains why there is need to teach students in groups to ensure active learning for students. “Learner centered approaches encourage active learning by the students which in return can lead to increased motivation to learn, greater retention of knowledge, deeper understanding and more positive attitudes towards the subject being taught” (Michael, 2006, p. 160).

Another subject content covered was cooking with briquettes. Although we had planned to use an oven that uses briquettes as a source of heat, it did not happen as planned. The demonstration kitchen did not have this equipment therefore we had to improvise. As earlier noted my students had to come up with a solution to this challenge.

## 2.6 Learning Process

We divide the learning process into sessions; the first session usually involved getting instructions and reminding ourselves with the set objectives of that particular task. The second session usually involved the execution of the task and the final session involved evaluation of the entire process. During the learning process, students had to be active in class and in this way teacher's monotony reduced. This further emphasized the use of learner centered approaches to teaching the selected topic.

According to Michael (2006, p. 160) active learning as the process of having students engage in some activity that forces them to reflect upon ideas and how they are using those ideas. It also requires students to assess regularly their own degree of understanding and skills at holding concepts or problems in a particular discipline. The attainment of knowledge is by participating and collaborating. It is also a process of keeping students mentally and often physically active in their learning. This can be through activities that involve them in gathering information, thinking and problem solving. This means that learners learn as they participate and collaborate with others.

Teachers facilitated and guided learners into discovering new knowledge. Students had to note down their notes regarding the procedures of how to make briquettes instead of the teacher reading them out to them. Group work was encouraged where students had to share responsibilities and knowledge as new challenges came up. The students that had knowledge about briquette making headed the groups and therefore shared their knowledge to their fellow students. As earlier noted in my project three, "meaningful learning only takes place through personal involvement by students, when it is self-initiated and the learners evaluate to know whether it leads to what they want to know or meet their needs" Bjerknes (2002) in (Ochan, 2012, p. 6).

According to UNESCO (1987) in (Ddungu-Kafuluma, 2014, p. 1) "teachers can only manage learning effectively if they give importance not only to what is taught, but the way in which it should be prepared and taught". Learners therefore had to be responsible for their learning and thereafter share their experiences and reflections after the lessons. Learners had to create their own knowledge during the lessons. This is because the essential role of vocational education is to "facilitate the construction of knowledge through experiential contextual and social methods in the real-world environment" Lynch (1997, pg. 27) in (Kerka, 1997, p. 5).

To effect active and collaborative learning, we had to shift from the “normal” classroom to outside compound so that students are a little free to move. This did not only encourage them to work harder but also motivated them as they interacted with other teachers and students from other classes. Students were encouraged to explain to them what the main concept embedded in the project. Through group work, students were able to achieve the goals earlier set since every member was accountable to the outcome of the project.

Shakarian in Faust and Paulson (1998, p. 12) noted that when students work in groups, they have the opportunity to state their own views, to hear from others, to hone their argumentative skills and so forth, without the administrative requirements of group work. It makes it virtually impossible for students to avoid participating, thus making each person accountable. In addition, Bell (2010, p. 40) noted that “group dynamic creates an interdependent team in which students must each do their part, and as a result, a natural consequence exists for those students who do not demonstrate accountability”.

In the same context, Grabinger, Dunlap, and Duffield (1997, p. 8), noted that “through collaboration with classmates, students refine and enhance what they know. When a solution is at hand, they present, justify and debate solutions, looking for the best possible resolution to the problem”. This concept is not any different with Mjelde and Daly (2006, p. 125) who noted that another aspect of vocational pedagogy is the learning that occurs in the course of interacting and cooperating with others.

In figure 3, below I present two learning situations observed. Figure 3(a) shows students during active learning. According to the figure, students seem happy as they explain what they were doing to one of the staff members at the institute. Students are free to speak to each other as they work and in that way they share knowledge and experiences.

Figure 3(b) shows students in the traditional lecture method. From the figure it shows how everyone is eager to write whatever the teacher says and learner contribution is very minimal. Here every one minds their own business and work towards passing examinations with much interaction with fellow learners.



a)



b)

*Figure 3: a) shows students during the project while b) shows students before the project was introduced.*

## **2.7 Evaluation**

Evaluation was a collective effort done by both teachers and learners who participated in the project. The learners evaluated the teachers' ways of teaching and delivery of content in comparison to what they had already experienced. Students also evaluated their fellow students work and provided immediate feedback concerning the quality of students' participation in class. Students also did evaluation of each phase of the project before progressing to the next phase. This was done through reflections and discussion of the observations made during a particular phase. This time round there was no need for the students to write a theoretical course work and tests.

“After having accomplished a task, it is essential that learners evaluate the effectiveness and efficiency of the plan and their strategy use” Newby, (1996); Zimmerman,(2000a,2006) in (Jossberger et al., 2010, p. 421). “Evaluating their process and reflecting on experience can increase learning from actual experiences and can eventually be used in future” Ertmer and Newby, (1996); Fowler, (2008) in (Jossberger et al., 2010, p. 421).

Participants did evaluation during the learning process and at the end of the lessons. Students filled logs (to be discussed later in the methodology chapter) indicating their experiences in class with evaluation of the entire teaching and learning process. This helped us to know what exactly students thought and felt during the previous lessons and the areas that needed improvement.



During evaluation, students and teachers had to sit together to share their experiences during the lessons and the key areas included; Student participation in Class, Students' interaction with other students & their ability to communicate effectively with their colleagues and their ability to create new knowledge & their ability to share knowledge amongst themselves. According to Ertmer (2015, p. 9) "self and peer evaluation should be carried out at the completion of each problem and at the end of every curricular unit".

Students evaluated the quality of lesson delivery by the teachers before the project started, during the project execution and at the end of the project. They also analyzed the teaching methods chosen in comparison to the previous methods used, with respect to the quality of learning they had gone through. They also analyzed the applicability of the skills and knowledge in their societies and later in their future field of work.

## **2.8 Summary of Chapter two (2)**

This chapter has presented the didactical relations model in relation to how its guidelines helped the researcher come up with a better teaching and learning process. The changes made to the teaching and learning process focused on making it better. With reference to the model, it was evident that all the factors in the model work in relation to each other and once one changes or improves, the impact is felt by others leading to an improved teaching and learning process.

Another main issue to note was the ability of learners to evaluate both their own work and that of their teachers. This was very unusual for them owing to the fact that the education system that we operate under does not have such provisions. They found it very strange though they liked it.

Analyzing the relationship between the learning resources, learning processes, pedagogical framework, educational content, goals, objectives, and evaluation, gave me a greater understanding of the teaching and learning process. Knowing each component and its relevance helps is key in improving the teaching and learning process. This is because "the major concerns in the 21<sup>st</sup> century to all educators is shifting education from mere learning to effective management of learning by teachers" UNESCO (1995) in (Ddungu-Kafuluma, 2014, p. 1). In the next chapter, the literature about the importance of vocational education, the teaching and learning process and importance of active learning will be presented. It also presents the different databases which were consulted during literature search.

## **CHAPTER THREE: THEORY**

### **3.1 Overview**

This chapter presents literature considered useful for this project. Most of the literature and theories were obtained from the HiOA online library and learning center. It was also necessary to seek information from the books in the HiOA library especially those published in English language. Throughout the literature search, the researcher utilized google scholar to obtain information especially from books that could not be found in the HiOA library. These provided very rich information about my research topic and I have referenced them here. Other databases like “ERIC” and “Taylor and Francis” provided literature some of which is documented in this report.

Since I do teach in a vocational institute, I found it necessary to first discuss information about vocational education and its importance to the country and the individual. I also present information about the theories about learning most especially active learning. I will also talk about teacher-centered type of learning. Since we carried out a project, I will also write about project-based learning. This chapter also presents information about briquette making and their various uses in the world. to a greater extent, the literature presented here was determined by the objectives that guided the research and with reference to the problem statement.

### **3.2 Vocational Education**

In my own perspective, I feel vocational education should be taught in such a way that enables graduates not only practice what they have learnt at school but also be able to solve community problems. This therefore means that the major subject content in a particular course or course unit should consider the graduate as a whole individual not only the content in the subject matter. This means that the teachers should ensure that vocational education learners are equipped with other skills like ability to communicate, work with others and share information much as they may not be included in the subject matter.

According to Winer; Oni in (Akhuemonkhan & Raimi, 2013, p. 3) TVET is a specialized education designed to empower learners through the development of their technical skills, human abilities, cognitive understanding, attitudes and work habits in order to prepare learners adequately for the world of work or positioned them practically for self-employment after graduation.

Amoor, (2011) in (Ayeni, 2015, p. 103) noted that vocational education is the core of both the individuals and society's economy. In the course of acquisition of skills, individuals could discover their environment or surroundings and harness the resources within it, which could serve them since the wealth of the society determines largely the development of such a society.

As noted by the different scholars earlier mentioned, it believably true that vocational education is very necessary to both the individual. It is therefore necessary for every individual to at least acquire a given skill that can enable them survive in the society.

TVET is concerned with acquisition of knowledge and skills for world of work to increase opportunities for productive empowerment and socio-economic and rapidly changing environment. TVET thus not only equips people with technical and vocational skills but with a broad range of knowledge, skills and attitudes that are now recognized as indispensable for meaningful participation in work and life Mclean and David in (Ayonmike, Okwelle, & Okeke, 2015, p. 25). "The major thrust of TVET thus can be described not just as knowledge or facts but includes also practice and comprehensive command of one "peculiar ability after training in solving human problems"(Okoye & Michael, 2015, p. 1).

According to Atechoarena and Delluc (2002, p. 13) the emerging focus on learners motivation and incentives seems to lack relevance in educational environments where the main issues remain the ones of access and provision. Poor and in some countries decreasing quality of training present major challenges. More support and attention is required at institutional level to change public providers' attitudes while improving quality provision.

Skills and knowledge are the engines of economic growth and social development of any Nation and technical and vocational education and training holds the key to training the skilled and entrepreneurial workforce needed for the changing technological workforce (Goel, 2010; Afeti 2010) in (Ayonmike et al., 2015, p. 25). According to Nyerere (2009, p. 4), Skills development encompasses a broad range of skills (entrepreneurial, communication, financial and leadership) so that the individuals are equipped for productive activities and employment opportunities like wage employment, self-employment and income generating activities.

### **3.3 The Teaching and Learning process**

The teaching and learning process involved choosing an appropriate teaching method. Before choosing the teaching method, the needs of the learners like interests, prior knowledge and their desire to participate actively in the teaching and learning process were of great importance. The selection of the method of teaching also involved a consideration of the theories of learning and in particular, constructivism became an area of emphasis.

According to Richardson (2005, p. 3), Most constructivists would also agree that the traditional approach to teaching – the transmission model – promotes neither the interaction between prior and new knowledge nor the conversations that are necessary for internalization and deep understanding. The information acquired from traditional teaching, if acquired at all, is usually not well integrated with other knowledge held by the students. Thus, new knowledge is often only brought forth for school-like activities such as exams, and ignored at all other times.

Constructivism views learning as an active process in which learners strive for understanding and competence on basis of their personal experience. Learning is constructivist because previous knowledge is revised, reorganized and even reinterpreted in order to reconcile it with new input (Mjelde & Daly, 2006, p. 89).

Reflecting on the constructivists view about learning and learning and my own experience as a teacher, I believe that learners need participate in all activities in the teaching and learning process. This therefore means that vocational teachers need to change from traditional teacher centered methods of teaching to more learner-centered approaches that emphasize active learning. In this regard, it was paramount to consider project based learning as a way of actively involving learners in the teaching and learning process.

Project based learning (PBL) is a learning method that places students at the center of the learning process. It is widely used to replace the traditional teaching method in which the teacher, who is the center, strictly follows the teaching plan. In PBL classroom, the teacher leads the students to the learning that they desire or learning following the project objectives. The PBL process thus involves an in-depth learning process with systematic learning management to get useful and applicable results, create motivation, and reinforce necessary living skills(Buck Institute for Education, 2010; Harris and Katz, 2001; Moursund, 1999) in (Boondee, Kidrakarn, & Sa-Ngiamvibool, 2011, p. 499).

To effect project based learning, students and teachers in the pastry and bakery department generated a project. The project addressed issues to do with recycling kitchen refuse to generate an alternative source of energy that the students could use to bake their pastry products during practical lessons. The kitchen refuse was recycled to make briquettes as one of the ways of disposing of kitchen refuse in order to create a clean environment.

From Grabinger et al. (1997, p. 5) view, learners need to: Determine for themselves what issues need to be addressed when facing a new problem, identify knowledge and skills they already possess that can be applied to the situation. [They also need to] determine which skills and knowledge areas are deficient and create learning plans to address those deficiencies, create timelines and monitor their progress, apply what they know to problems that may change substantially from one moment to another. [And finally they need to] assess their performance and make changes in personal processes for use to meet subsequent challenges.

During the project, students and teachers had a set of roles and rules that were set before the start of the project and students had to take a central position in the teaching and learning process. It is argued that, like masters, teachers should scaffold instructions by breaking down tasks, use modeling, prompting and coaching to teach strategies for thinking and problem-solving; and gradually release responsibility to the learners (Blumenfeld et al., 1991, p. 371). However, Colley, James, Diment, and Tedder (2003, p. 473) noted that prescribed curricula for VET courses emphasize the acquisition of skills (job specific and transferable) along with “underpinning” knowledge to ensure their appropriate deployment in the work place.

Illeris, (2002,2007) in (Poortman, Illeris, & Nieuwenhuis, 2011, p. 269) noted six social interactions during learning as; perception, transmission, experience, imitation, activity and participation. In perception, the learner may register information by observing or hearing colleagues in his/her vicinity and when the learner is actively listening, taking notes or otherwise processing information, then this is transmission. The learner gains experience when he/she tries out performance under the guidance of a mentor, teacher, workplace instructor or a regular colleague.

According to Grabinger et al. (1997, p. 6), the instructional activities, in which learners need to be engaged, should require them to take personal and active roles in all aspects of knowledge construction and problem solving processes. A learning environment that places learners in the driver's seat of the learning process- involving them in planning, controlling and directing of learning activities and the application and assessment of the learning processes and outcomes.

Considering the theories above in comparison with the project carried out with the students, it is necessary to note that actively involving students in the teaching and learning process is paramount. Considering students' prior knowledge about a given subject matter is also of great importance before introducing new knowledge. In this case, students already had knowledge about disposing refuse that they had done in the communities where they lived before joining the hotel school. It was also necessary to create new knowledge basing on the experiences acquired during the project. The teachers therefore had to create an appropriate learning environment that could encourage knowledge creation.

This is also in line with the constructivist theory of learning, "it suggests that individuals create their own new understandings, based upon the interaction of what they already know and believe, and the phenomena or idea with which they come into contact" (Richardson, 2005).

In vocational teaching as an example, it is necessary for the vocational teachers to choose the right approaches to teaching especially learner centered approaches like project based learning in order to produce a holistic graduate. When students are empowered to create their own knowledge, I believe there is a likelihood for them to create their own income generating activities. In the same context, Klein-Collin, (2012) in (Okoye & Michael, 2015, p. 1) agreed that the major aim of VET, is to become an instrument of self-employment to the individual who has been empowered not only by subject matter inhibition but who through experimental learning perceived it as a real life solution to problems and can make use of his initiative in labor market.

Given the prevailing economic trend, UNESCO, (2014) in (Dasmani, 2011, p. 70), identified the two major objectives of TVET as the urgent need to train the workforce for self-employment and the necessity to raise the productivity of the informal sector. With reference to the project, students worked as a group with common interests. During the project, learners exhibited several skills that would not only be instrumental for them to acquire formal employment but also help them generate their own employment.

Though they experienced quite a number of challenges, they were able to attain the result of the project. This means that their problem solving skills greatly improved. They also learnt to collaborate with each other in order to attain their goals.

According to Bereiter and Scardamalia, (1993) in (Tynjälä, 2008, p. 145) it is through problem solving that formal knowledge acquired in education is transformed into an experts flexible informal knowledge. The process of integrating theory, practice and self-regulation are viewed as a problem solving process where students simultaneously need to solve practical problems and related conceptual problems that is problems of understanding. As a result instead of traditional forms of delivering knowledge, problem solving tasks should form the core of education of skilled workforce.(Tynjälä, 2008, p. 145).

Internationally the concept of 21<sup>st</sup> century skills has grown in recent years and is allied to the concept of key competences that include ways of thinking like creativity, critical thinking, problem solving, decision-making and learning. Other 21<sup>st</sup> century skills include, ways of thinking like communication and collaboration (Harper, 2016, p. 8). To achieve this goal of skills development, Uganda in particular developed a strategic plan known as skilling Uganda that denotes paradigm shift for skills development in Uganda.

The main purpose was to create employable skills and competencies relevant in the labor market instead of educational certificates. It was also to embrace all Ugandans in need of skills, including but not only primary and secondary school leavers. Among the priority investment programs was BTVET instructor training. This therefore meant that in-service training for teachers was necessary. Okou (2002, p. 5) however noted that with such good objectives and aims, the supply and quality of teachers is still a big problem with most teachers being undertrained. Good technical and vocational training requires instructors who have technical skills, industrial experience and pedagogical skills.

From the above concept, it would be necessary for the schools to first establish the competences that are needed by the employers before generating the curriculum. Most times, schools develop their curriculum according to what they think is necessary for that particular course. In this case, we have been training students to use gas and electricity to bake cakes yet at Ntake bakery where students are likely to work have already embarked on the use of briquettes.

This was realized when students requested to tour the bakery but it was not in plan to incorporate briquette making in their program. At the bakery, workers do work in groups yet at school students train to work individually, this therefore compromises the students' ability to work in such an environment.

Several scholars believe that when students are challenged with a situation that requires thinking to overcome it, they learn effectively and they seem to obtain the solution faster if they work in a group. Through sharing passed experiences and prior knowledge, students also acquire more knowledge about a given subject matter. To some extent, thinking and working as a group makes students work faster and as they try to solve the challenge, they consult each other. As a result, they learn collaboration, sharing knowledge and owning the results of their efforts.

During the project, learners did not only acquire knowledge and skills about the subject matter but they also learn other skills like how to communicate to their fellow students, other people who were not part of the class, solving the immediate problems as they occurred, they also learned to work in a group. Some of these skills were not planned in their vocational curriculum but managed to learn them as the teaching and learning process went on. Learners also learnt how to appreciate other learners' efforts and learning differences.

Teachers therefore need to create an environment that empowers students to share the knowledge they already have. Teaching therefore should consider the students' prior knowledge and experiences. It creates fulfilment to the students especially if teachers do not consider students as receivers of information given by the teachers. In this case where the students at UHTTI, Jinja who are already mature, it follows that they have already gone through some experiences as they grow and sometimes already worked in such fields. It would therefore be necessary to consider their prior knowledge and experiences before introducing new knowledge.

When students are actively involved in the teaching and learning process, assessing their progress becomes more realistic and learners own the outcome of their efforts. It becomes far much better especially when students review their own work as well as that of their fellow learners.



They also learn from each other and help each other to improve and perfect their skills and knowledge. To ensure effective learning and democracy in class, the roles of the teacher as well as for the learners were defined. According to Soparat, Arnold, and Klaysom (2015, p. 15), the teacher has the following roles to play: 1) knowing: the teacher must have knowledge to provide but also help learners to construct their own knowledge. [He also has the role of] facilitating: the teacher is a supporter and facilitator for learners needs, context providing: teachers provide appropriate classroom settings which contain learning resources, learning tools and media and social context for learners to work collaboratively. [The teacher has a role of] assessing: the teacher prepares assessment tools which reflect the performance assessment and follow-up of learners' progress.

Considering the above guidelines, teachers had to obtain knowledge on how to make briquettes especially from the factory that manufacture briquettes. Teachers also sought Basic skills and knowledge about the different types of briquettes. This formed a foundation on how we would guide our learners without difficulty and from an informed point of view. Teachers also had to seek knowledge about learner-centered approaches especially how to involve learners in the teaching and learning process. Key factors to note were, planning, executing the project and evaluation of learners' achievements.

The teachers therefore had to acquire quite a lot of information about the subject matter under investigation in order to help students especially when they consulted them. Teachers needed to be knowledgeable in order to conduct lessons well and to avoid confusion of concepts in class. The teachers also provided the raw materials, ingredients, and tools that facilitated the successful progress of the project. Teachers also had to change from the normal routine classroom environment to the outside compound. This provided an environment that was conducive for interaction not only with their fellow students but also with other students from different courses.

The teachers also prepared assessment forms for the learners and encouraged immediate feedback from fellow learners. They also had to fill logs about their experiences in class and these formed a basis for the discussion that later led to improvement.

It was also necessary to make reflections about what teachers taught on a particular day. To address this, students had to fill logs that reflected what had happened on a particular day. They also had to discuss their findings as a group and later the student leader could write out one universal log that they discussed before the teachers.

Brookfield and Preskill in Jakubowski (2003, p. 26) noted that discussion has the following values; 1) to help participants reach a more critically informed understanding about a topic or topics under consideration, to enhance participants self-awareness and their capacity for self-critique. [It also] foster (s) an appreciation among participants for the diversity of opinion that invariably emerges when viewpoints are exchanged openly and honestly and act(s) as a catalyst to helping people take informed action in the world. This created a sense of responsibility and ability to work as a group to come up with the required decision; which is one of the competences required in the 21<sup>st</sup> century.

After making their products, students reflected on what they had done in comparison with other students. de Bruijn and Leeman (2011, p. 698) noted that through reflection on their learning and work experiences (together with peers, teachers and trainers) students gradually develop an autonomous work attitude and vocational habitus. Learning activities like integrating, generalizing and articulating are expressions of reflective learning. This also helped them to improve their products and to learn from their classmates. After the project learners had to present, their products to the teachers who also assessed their performance and students shared their experiences, achievements and challenges to other learners for feedback. “Collaboration is essential in the world after school. Most learners find themselves in jobs where they need to share information and work productively with others” (Ertmer, 2015, pp. 8-9).

In the same context, CTGV in (Grabinger & Dunlap, 1995, p. 10) noted that assessment of students must take more realistic and holistic forms, utilizing projects and portfolios and de-emphasizing standardized testing. Educators are increasingly aware that conventional achievement and intelligence tests do not measure the ability of people to perform in every day settings and adapt to new situations.

In my own perspective, to achieve the 21<sup>st</sup> century skills, teachers need to use the right methods of teaching. They should also encourage collaboration and communication among learners that is not possible in teacher centered approaches. There is need to teach students who can meet the needs in the current work place.

### **3.4 Briquette making**

One of the major requirements in the pastry and bakery course is energy. Energy completes the cycle of preparing pastry and bakery products. This is because it provides a medium under which pastry products are cooked. Without energy, it might not be possible to cook most of the pastry products like cakes and bread. Energy is not only useful to the pastry and bakery students but also the country as a whole.

Energy and fuel use are important for the welfare of households in developing countries. To this day, many people remain dependent on traditional biomass fuels for cooking and on inefficient and costly sources of light such as candles and kerosene. Improving access to modern energy sources like electricity and clean cooking technologies is important for the development and improving health and education. Clean cooking fuels are important for combating the high levels of indoor air pollution encountered whenever traditional solid fuels are used for cooking and heating (Heltberg, 2003, p. 10). Presently the major source of energy to the rural community is fuel wood because other sources of energy (electricity, gas and kerosene) are either not available or grossly inadequate where available and they are beyond the reach of the masses (Emerhi, 2011, p. 237).

At UHTTI, Jinja the situation is not any different from other parts of the country. Many times load shading is experienced and the situation becomes worse when it happens during a practical lesson. This means that the lessons have to be paused yet the time factor does not pause. Load shading could be a little manageable but considering the price per unit of electricity consumed, it becomes very expensive to run such an institute. This therefore means that a cheaper alternative source of energy is necessary.

According to Gebrezgabher, Amewu, Taron, and Otoo (2016, p. 2) whom I also agree to, waste processing business models such as dry fuel manufacturing (briquetting), biogas and gasification or energy service company models have the potential to counteract many adverse health and environmental impacts connected with traditional biomass energy.

Considering the Ugandan experience where most households depend on firewood to do most of the cooking, such interventions can help save the trees. The materials out of which briquettes are made are dimed useless and usually left to rot away.

Briquetting refers to the process of converting low bulk density biomass into high density and energy concentrated fuel. Cohesion is achieved by low pressure agglomeration with the use of binders, medium pressure compaction with a lower binder percentage or high pressure compaction with little or no binder, (Mwampamba, Owen, & Pigaht, 2013, p. 158).

According to (Njenga et al., 2009, p. 1) production of fuel briquettes involves the collection and compaction of a combination of combustible waste materials that are not directly usable because of their low density and processing them into a solid fuel product of any convenient shape that can be burned like wood or charcoal.

Conversion of organic waste into fuel briquettes has been undertaken by NGOs in various countries. In Namatala slum in Mbale, eastern Uganda, briquettes are made of discarded coffee hulls, rice husks, charcoal particles, sawdust, wood chips and waste paper. The paper acts as a binder for other materials. The group sells some of the briquettes while the rest are used in their homes, UNEMA, (2007) in (Njenga et al., 2009, p. 2).

Most of the raw materials for briquette making are very bulky and with a lot of moisture. Most of them may not be used directly for cooking unless further processing is done. Considering the banana peelings as an example, there was need to first dry them and later compact them to create an energy source with a higher energy density and reduce on the storage space required.

In briquetting operation, the entrapped air must be dispelled to avoid making a spongy or loose briquette. A spongy briquette deteriorates in storage and also does not exhibit desired results from the stand point of the briquette being a long burning and efficient fuel(Olivier, 2010) in (Ngusale, Luo, & Kiplagat, 2014, p. 754). The quality and burning time of the briquettes reduces if they are not compacted well.

During the project, students made a variety of briquettes and compared the time taken for the briquettes to completely burn out. With the rapid industrialization, the energy requirement is also increasing proportionately and the present power supply is unable to meet the energy demand. In the present scenario, energy scarcity is a major problem throughout the world. The use of biomass and waste fuels is a growing area based on sound economic and environmental benefits (Veeresh & Narayana, 2013, p. 1375). Briquettes have a potential to be a source of renewable energy if they are made from sustainably harvested biomass or waste agricultural residues (Ferguson, 2012, p. 4).

As noted by Yaman et al, 2000; Olorunnisola (2004) in (Emerhi, 2011, p. 237) briquette making has the potential to meet the additional energy demands of urban and industrial sectors, thereby making a significant contribution to the economic advancement of developing countries. Besides, briquettes have advantages over fuel wood in terms of greater heat intensity, cleanliness, convenience in use and relatively smaller space requirement for storage.

Well-made briquettes have the capacity to generate enough heat that can aid performance of various activities both at home and the industry. Considering Ntake bakery, they have embarked on using briquettes to do most of the cooking in the factory. This does not only save them the high cost of electricity but it also saves the degradation of forests. Most of the Ugandan forests are at a risk of getting extinct due to too much encroachment especially in search for firewood. If only briquettes technology could be empowered, it could lead to environmental conservation. Briquette making does not only provide energy but they are also a way of disposing of refuse. This creates a clean environment to live without any risk of hygiene related illness.

Briquettes have numerous applications ranging from domestic use for cooking and heating to space heating in the poultry industry. In Europe, USA and other developed countries, briquettes are used domestically mainly for barbecues. In Asia, briquettes are used for domestic cooking, firing of boilers, heating of water in tea shops and cooking in small restaurants, (Mwampamba et al., 2013, p. 159).

In sub-Saharan Africa, uptake is limited in scale but still covers a diverse range of applications; domestic cooking such as heating in poultry houses, heating water for the hospitality industry, fueling outdoor braziers in dining areas, meeting the demands of the growing barbecue market and to some extent providing a domestic cooking fuel (Mwampamba et al., 2013, p. 159). “ In comparison with charcoal, they generally burn for longer and have a more consistent heat output, which is preferred by certain market segments such as restaurants, hospitals and schools”,(Ferguson, 2012, p. 7). “The relative cost of disposing the biomass wastes to the environment might contribute more greenhouse gas emissions than making briquettes”, (Ngusale et al., 2014). “Briquettes also improve health by providing a cleaner burning fuel” (Demirbas, 2009, p. 1698).

According to Emerhi (2011, p. 237) [who noted that] in addition briquetting engenders many micro enterprise opportunities that include production of the press from locally available materials using materials like agricultural waste and sawdust, briquette production enterprise, packaging and selling of the briquette. It also improves health by providing a cleaner burning fuel and also provides a better alternative to firewood (40% more efficient, longer burning and better) as well as helping protect the environment by reducing the number of trees cut for firewood.

With reference to Wangari Maathai's idea of conserving the environment through planting trees (Maathai, 2011), I feel it is necessary to embrace it. In addition to her concept of planting trees in Africa, I feel there is need to embrace other sources of energy that utilize very cheap raw materials and at the same time improve sanitation. These include recycling of kitchen refuse to make briquettes.

### **3.5 Summary of Chapter Three (3)**

In this chapter, I have written about the databases where I obtained the literature. I have also written some information about what people expect from vocational education to both the individual and the nation. Vocational education has always been an engine in the development of many economies in the world. This is because it equips learners with employable skills that can make them survive in the world of work.

As noted by Billett (2014, p. 1), "vocational education is an important and worthwhile project. Its goals and processes are directed to meeting salient societal, economic and personal purposes". Tynjälä (2008) in Gijbels, Raemdonck, and Verweken (2010, p. 1), noted that in today's rapidly evolving society, we are confronted with an exponential increase in information, growing need for innovation and the requirement to develop sufficient skills. Schools, enterprises and players in the field of training are faced with the challenge of finding, valuing and further developing every talent. The high level of competence and innovative capacity on which the economy is based are strongly determined by the development and training which employees have under gone.

I have also noted the need for active learning in relation to vocational education. I have also noted the roles of the teachers and learners in the process of active teaching and learning. Efficient knowledge and skills acquisition require a knowledgeable and flexible teacher.

This means that the teacher has to consider learners different learning needs, their involvement in the teaching and learning process and prepare a learning environment, which encourages creation of knowledge. I have also presented some information about briquette making and most importantly the importance of recycling refuse to generate a cheap and alternative source of energy. In the next chapter I will write about the methodology; this includes the research design, research approach, sample population, data collection techniques, validity and reliability of the findings and ethical considerations in research.

## **CHAPTER FOUR: METHODOLOGY**

### **4.1 Overview**

This chapter presents a detailed discussion of the research design and approach employed, research participants, data collection tools, validity and reliability and ethical considerations in this research.

### **4.2 Research Design**

The study employed a qualitative research design. According to Creswell and Clark (2007:33) in (Aguti, 2015, p. 26), “qualitative data provides a more complete picture of noting trends and as well as in-depth knowledge of participants perspectives”. Qualitative researchers are likely to delight in having their ideas challenged and a core activity of qualitative research involves “problematizing” concepts and rendering strange the mundane or taken for granted Barbour (2000) as quoted in (Barbour & Barbour, 2003, p. 2). Basing on these authors, I was compelled to apply qualitative research design in this study.

### **4.3 Action Research Approach**

In addition to qualitative research design, the study applied action research approach. This was because the major aim of the project was to improve the teaching and learning process of pastry and bakery. Through active participation, they contributed ideas to which they felt fully accountable. Action Research is about evaluating your practice to check whether it is good, as you would like it to be, identifying any areas that you feel need improving and finding ways to improve them. Through studying and working with your practice, you can turn yourself into a reflective practitioner, critical thinker and an agent for personal and social change Schon (1983); Brookfield (2013); Arendt (1958) in (McNiff, 2016, p. 9).

In the same context, Cochran-smith and Lytle, (1992) in (Zeichner, 2001, p. 279) asserted that action research alters teachers talk about students from a focus on students problems to an emphasis on student resources and accomplishments and leads to more learner-centered classrooms. It was also noted that “this approach endorses consensual, democratic and participatory strategies to encourage people to examine their problems or particular issues affecting them or their community”, (Berg & Lune, 2012, p. 263).



According to Hiim in (Hiim, 2007, p. 100), pedagogical action research refers to “studies that include systematic collaboration in planning, carrying out, evaluation and critical analysis of teaching and learning process, with the aim of improving and documenting new knowledge of teaching and learning processes in school and work life”. With reference the above definition of pedagogical action research, it was evident that it was necessary to analyze the teaching and learning process in collaboration with all those concerned.

The action research project carried out was inclined on improving the teaching and learning process, with reference to the didactical relations model earlier discussed in chapter two of this report. This showed the relationship between the factors that contribute to a good education system and how the teachers and learners can utilize it to improve their own. This therefore formed the basis of the action research carried out.

According to Zuber-Skerritt (1996b:85) in (L. Cohen, Manion, & Morrison, 2011, p. 346) Action research is critical and (self-critical) collaborative inquiry by reflective practioners being accountable and making results of their enquiry public, self-evaluating their practice and engaged in participatory problem solving and continuing professional development. My action research experience started when I did my project three (MAYPH 4300). We carried out that particular project at the hotel school in Jinja where I currently work. Here I got wonderful experience in doing research with people instead of doing research on people. We generated problems & solutions as a group (institute) as well as the implementation of the best possible solution. It was after the evaluation of this project that we generated another issue discussed in this thesis.

Action research is grounded in lived experiences, developed in partnership, addresses significant problems, works with (rather than studies) people, develops new ways of seeing /interpreting the world (i.e. theory) and leaves infrastructure in its wake (Bradbury & Reason, 2003, p. 156). From this perspective, the experiences from my own studies as a teacher trainee and those for my students formed the basis of improving the teaching and learning process. This is because we went through the same education system and therefore reviewing it and generating new ideas was from an informed point of view. The experiences got from the previous project with students was also quite vital because it laid the foundation and the key areas to note in the new project were a little clearer than before.

According to McNiff and Whitehead (2009) who noted that, “With the cyclic nature of action research, it is possible to introduce change and refine the next cycle of the research based on experience and reflection.” After the previous project, we sat with the students and evaluated the entire process basing on what we had agreed to implement. The evaluation yielded the key areas that needed improvement and these included, learners needed more time to practice on their own, there was need to do more learner evaluation and assessment of the teachers facilitating qualities. The first project carried out formed the first cycle and therefore the thesis is the second cycle of action research.

#### **4.4 Sample population**

Eight Students of BCPB 2015 September intake participated in the study. The choice to involve them in the project depended on the students’ interest to start up their own income generating activities after school. The students are all of mature age (above 18 years) and had been to the field of work as internship students. They therefore wanted a more interesting class instead of listening to the teachers’ views all the time.

All of them attained a basic certificate in Ugandan secondary education known as Uganda Certificate of Education (UCE). This is a national examination done at the end of ordinary level of education (lower level of secondary education) in Uganda. After ordinary level they claimed to have failed to progress to the next level of academic education because they did not perform well in the previous examination. They have however spent a considerable amount of time out of school until they learnt that they could attain a basic certificate in pastry and bakery at UHTTI for one year and still acquire knowledge, skills, and later progress to another level of education. They had so far spent one semester at the institute and studied other course units like safety and hygiene and this semester they were learning Energy Conservation and later start to work.

They also argue that since pastry and bakery is a practical course, they think they want to start their own businesses instead of looking for the few jobs. Two of the students had knowledge about how to make briquettes and was ready to teach other students how to make them. She had also used them at home to warm chicken house, though it was a different type from what we made during the project. I discovered this after giving students chance to express their interests and analyzing their previous information before enrolling for the course.

Two colleagues from the pastry and bakery department actively participated in the project. These also provided information about the subject matter and participated in the assessment of the teaching and learning process. G. Brown, Bull, and Pendlebury (2013, p. 3) noted that given the challenging nature of assessment it seems sensible to work with a group of colleagues or if not possible, then with a colleague. A group of interested colleagues within the department or school can build upon their common knowledge of the subject involved and they may have a greater impact than (...) one individual upon course design, course delivery and the quality of student learning.

## **4.5 Data collection instruments**

### **4.5.1 Interviews:**

Interviews collected information that the researcher had little knowledge from respondents especially those who did not actively participate in the project. According to Kvale in (Aguti, 2015, p. 34), interviews seek to describe the meanings of central themes in the world of subjects, thus the main task of interviewing is to understand the meaning of what interviewees say.

Interviews were conducted with the immediate employers of our graduates especially those at Ntake bakery. The employer provided information about the importance of actively involving learners in the teaching and learning process, teaching learners in groups and the effectiveness of using briquettes to cook. The other person interviewed was the principal of UHTTI, Jinja. She also provided her views about teaching students in groups, actively involving them in the teaching and learning process and the idea of using briquettes to facilitate the teaching and learning process of pastry and bakery. The researcher chose to use semi-structured interviews with open-ended questions.

An interview guide was prepared well in advance (find it attached in appendices) that was followed, though a little flexible. The questions were set according to the problem statement that guided the study. Since UHTTI, Jinja doubles as a training institute and hotel, the principal provided information as both an “employer” and “trainer” in the hotel perspective. The employer at Ntake bakery provided the industrial views. The researcher prepared one interview guide for both the principal of UHTTI and the employer at Ntake bakery.

The key questions that the interviewee responded to included their analysis about the current way of teaching and learning vocational education, ways how to improve teaching and learning process, the importance of actively involving learners in the teaching and learning process and to discuss the importance of teaching learners in groups. Their responses to these questions would help the researcher analyze and validate the teaching method chosen during the project. Another important aspect in the interview included the respondents' views about the use of briquettes in cooking pastry products. Another important issue discussed included the interviewees analysis of effective briquettes were in providing an alternative source of energy.

The researcher did a pilot study with one of the colleagues to test the quality of the interview guide and the necessary adjustments made before subjecting it to the required respondents. Bryman (2012) emphasizes that “researcher should pilot test their interview guides not only to know how well it is made but also for the researcher to gain experience”.

I used Interviews to collect data because they help to gather responses to open ended questions that reflect on participants' personal reaction to the phenomena under investigation rather than one elicited by way of forced choice between predefined options and to pursue in-depth information around the topic under investigation. Interviews encourage the interviewees to speak in their own voice and express their own thoughts and feelings Mc Namara in (Aguti, 2015, p. 35).

The researcher conducted interviews mostly at the respondents' convenient places and time. The principal of UHTTI, Jinja, preferred to have the interview conducted in her office during working hours at the institute. However, with the employer at Ntake bakery, it was not possible to create an ample space for the interview. We therefore had to discuss the issues as students toured the bakery. At the start of the interview, the researcher greeted the respondents to draw their attention to main subject of the day. The researcher had to inform the respondents the purpose of the interviews and emphasized that the information obtained was kept confidential and to be used only for academic purposes. To this effect one of the resource areas of my study refused cameras and any other filming equipment, to which the researcher obliged.

During the interview, the researcher maintained a good eye contact. The researcher had to listen attentively to the participants' views basing on the questions that were in the interview guide. The interview guide served as a checklist to remind the researcher of the questions to ask next. The researcher conducted all interviews in English language. Time management was key during interviews to use the time allocated optimally to avoid wastage.

To make interviews less stressing, the researcher asked throwaway questions to draw respondents' attention and to keep them interested. "Throwaway questions towards the beginning of the interview are necessary for effective interviewing. They are incidental and not necessarily for gathering the important information being examined in the study" (Berg & Lune, 2012).

The researcher noted field notes in a notebook which later were transcribed into meaningful data. Note taking was necessary to ensure that the researcher captured all information to reduce the error caused by forgetting, and to show the respondents that the information they shared was useful.

According to Holloway and Wheeler in (Aguti, 2015, p. 34) note taking is an important activity but it may disrupt the participants. In this regard, I had to take very brief notes that I could memorize easily so that I write up the entire story later. This was because some respondents did not want their ideas recorded while others were fulfilling company policy of no cameras or any electronic recording devices. Therefore, all cameras, phones among others had to off before the interview could begin. This was quite hard for the researcher but I had to consider ethics in research and to respect the concerns of my participants.

#### **4.5.2 Observation**

The students observed teachers' involvement in classroom activities and their ability to let students work on their own. They also observed how teachers controlled classroom environment and how they assessed learners' achievement in class. Students were also responsible for observing how their fellow learners did the work and their interaction during the teaching and learning process.

They also observed how they communicated with the teachers and fellow students. Students and teachers observed whether students made notes in class or waited for the teacher to make notes for them. They observed all activities as they happened in the class and noted them down and discussed them after the lessons. The main of observations was to help teachers improve the teaching and learning process from teacher controlled to learner-centered approaches.

DeWALT and DeWALT in (Kawulich, 2005), paragraph 8, recommends that "participant observation be used as a way to increase validity of the study, as observations may help the researcher have a better understanding of the context and phenomena under study".

In the same context, Halmarsdottir in (Nganda, 2010, p. 60) noted that participant observation helps in offering an excellent way of discovering how gender aspect affects the effectiveness of a learning group as well as demonstrating democratic values. This really helped the researcher observe whether the male worked closely and freely with their female counterparts or preferred to work on their own. It also helped the teachers to find out whether students made decisions in a democratic way in consideration of all members' ideas.

Participants noted all the observations as they happened during the project. The observations made included learners' ability to work with others, ability to share information with others during the teaching and learning process. Other observation key areas included teachers' ability to let students work on their own, students' ability to take own notes on their own during the project. It was also necessary to observe learners' behavior and expressions during the project.

Participants discussed the information obtained from observations alongside the reflections at the end of every phase of the project as a way of giving feedback to the participants. This would in turn help them to improve or change their mode of working. The researcher had to compile all the observations and transcribe them into meaningful data. The researcher made use of photographs to capture certain gestures that seemed hard to describe by words. Photographs also provided more information especially what the researcher would have missed out during observations. Photographs also provided more concrete evidence of what was taking place in class especially participants behavior that could not be noted by the researcher.

### **4.5.3 Logs**

Students and teachers filled logs whenever we had lessons. They recorded their experiences and reflections as they occurred. The logs provided a detailed evaluation of each activity that we had planned. Each time we had the lessons, students had to write what had happened, experiences that they had gone through, reflections and how best to improve. The teachers also wrote their reflections of the day after the students had written. Reflections formed a basis for improvement of the next lessons.

A learning log can serve as an ongoing laboratory notebook for learning. Diagnostic learning logs provide faculty with information and insights into a student's awareness of and skill at identifying strengths and weakness as a learner. The teacher can scrutinize a student's metacognitive skills, such as observing, evaluating and criticizing their own learning Angelo & Cross in (Baker, 2003, p. 11).

According to (McIntosh & Draper, 2001, p. 554), students should use learning logs frequently. Using them every day is not necessary, but they should be used several times a week. They also noted that the purpose of writing in learning logs is to have students reflect on what they are learning and learn while they are reflecting on what they are learning.

Students therefore filled logs during the lessons. The logs had guiding questions as seen in table 2 below. The importance of the logs was to ensure that students analyze how a particular lesson was taught and (...) suggest possible ways to for the teachers to improve. As noted by (McIntosh & Draper, 2001, p. 554), “responding to specific prompts in learning logs encourages students to address the teachers concerns”. As students reflect on what has been taught, I believe they are able to identify exactly what areas that need improvements that helps the teacher to ensure that all learners concerns are addressed. However, the idea of introducing logs in class is not easy as noted by (McIntosh & Draper, 2001, p. 554) that as with anything new, the teacher should anticipate mild resistance.

Event/Activity	Experience/what happened	Reflections /Remarks	Way forward/better way to do it

*Table 1: Copy of the Log used to record Learning Activities*

**4.6 Validity and Reliability**

The data collected in this study was not numerical therefore; the use of statistical data validation tools was not useful. Since it was action oriented and qualitative in nature, the researcher applied the following to ensure that the data collected was valid and reliable:

**Triangulation;** Holmarsdottir in (Nganda, 2010, p. 57) noted that validity of results in qualitative research is possible through triangulation and not necessarily involving large samples. This further helped me in choosing my sample size especially in choosing the students to work with. For easy monitoring, I chose to work with two teachers from the pastry and bakery department and eight students and this was quite a manageable number.

Denzin; Mathison in (Merriam, 1995, p. 54) suggested that to ensure validity and reliability in qualitative research, the researcher can employ triangulation. This entails use of multiple investigators, multiple sources of data or multiple methods to confirm the emerging findings. With this, I employed several methods of data collection that included interviews, observations and dialogue. In addition to the selected methods, I had to pay attention to the non-verbal communication gestures of the respondent to confirm that what they said was exactly what they felt.

The tools used to collect data were pilot tested before using them to collect the actual data. The interview guide was pilot tested with my colleagues before using them with the intended respondents. Bryman (2012) emphasizes that “researchers should pilot test their interview guides not only to know how well it is made but also for the researcher to gain experience”.

This is in line with Merriam (1995, p. 54) who suggested that the researcher can perform peer/colleague examination and collection of data for a long period of time to ensure validity and reliability of the research outcome. To validate the data obtained from the action research carried out, I had to write out a personal log of what I did, saw, and heard and what others did or said. I also noted their emotional expressions during different situations like during meetings, learning and teaching process and I drew my reflections from my observations throughout the entire process that helped me to evaluate my own actions for that particular day.

To guide the research, the researcher set objectives and standards at the beginning of the process upon which all activities anchored. I would also ask colleagues and students to write logs about my conduct and actions. These helped me to keep up the standards or to improve. “Feedback from participants is necessary because it consequently helps one to improve what they are doing” Flick in (Nganda, 2010, p. 55). According to (Mikkelsen, 2005) in (Nganda, 2010, p. 56), “continuous analysis is an important method in both data collection and validation. Early and continuous data analysis discovers data gaps, surprising perspectives at an early stage”.

Through log writing and reflections at the end of every lesson, we were able to ensure that all factors which would lead to invalid data are ruled out. This was one of the ways to carry out checks and balances to ensure that the set objectives and standards are met.



Questions like did I do it well, do I need to improve, is there another way I can do it better, could always ring in my mind and these helped me to collect meaningful data about my students and self. I also sought views from other teachers in the department of pastry and bakery to evaluate my learners' activities and behavior because I thought my learners could pretend to work very hard to impress me instead of valuing the task beforehand.

However, I noted that using logs to evaluate and record activities in class was a bit strange and therefore it was quite difficult for the teachers and students to fill out the logs. Since the challenge was detected at the beginning of the research process, I had to take them through the procedure of writing the logs. By the end of the research process, they had all mastered how to fill the logs.

Participants in the research process kept reflecting on the processes, their activities and conduct during the project. Reflections aimed at improving the next stage as well as learning from the previous stage. The challenges and experiences that we went through in the previous lessons gave a basis for improvement in the next stage. As a result, more valid and reliable data was gathered.

#### **4.7 Ethical Considerations**

The researcher sought permission from the principle of UHTTI, Jinja, through the coordinator of Master of Vocational Pedagogy at Kyambogo University (introductory letter attached in appendices). The principal therefore instructed the principal instructor in charge of academic, who happens to be the head of the pastry and bakery department. The principal instructor then had to gather the other teachers in the department to seek their consent to participate in the research project. However, the researcher had to first explain her intentions and describe the teachers' roles in the research before enrolling them in the project. They therefore had to accept participation from an informed point of view.

The researcher respected participants' choice either to either participate in the project or not. The researcher did not persuade participants but rather made the decisions themselves to participate or not. Those who chose not to participate did not face any consequences. Participants were also free to withdraw from the project at the time they thought was appropriate.

I also sought students consent before involving them in the research. Since the students were old enough to make personal decisions, there was no need to consult their parents before involving them in the research project. Students had to fill the consent form (attached in appendices) to show their commitment to participate in the research project.

The researcher gave participants one week to make a decision of whether to participate or not. There was no penalty for those who did not want to participate. Students were also free to withdraw from the project at the time they thought it was necessary not because the researcher could not allow them to go. According to Nolen and Vander Putten (2007, p. 403), to give consent freely, it is necessary that students particularly those in the classroom of the teacher conducting the research, feel no implicit pressure to participate. Students' decision not to participate must be fully respected and must not lead to any adverse consequences.

Although the topic under investigation was part of class work, it did not mean that those who did not participate missed the information or were to fail at the end of the semester.

The researcher sought permission to interview the employer at Ntake bakery on the day the students toured the premises. The researcher was one of the teachers who accompanied the students and therefore utilized this opportunity to get more information about what was taking place at the factory in comparison with what was at school. Since the time spent in the bakery was limited, it was quite hard to find an appropriate space for the interview therefore the respondent had to answer the interview questions as the students toured the bakery.

However, his anonymity and confidentiality were respected especially towards photographs and video tapping. These were not allowed in the bakery, which was respected by the researcher. To this effect, I chose to refer to him in this research as the employer at Ntake bakery instead of his real names.

Throughout the research, the researcher ensured that participants do not have unrealistic expectations regarding the outcomes of the research/project. The participants therefore had to set their own goals that they needed to achieve throughout the project. According to Khanlou and Peter (2005, p. 2337), Action Research involves recognizing the rights of those whom research concerns, enabling people to set their own agenda for research and development and so giving them ownership over the process. Since the researcher participated as both the researcher and the teacher, there was need to empower other colleagues in the department to help in the data collection.

This was in line with Nolen and Vander Putten (2007, p. 405) who emphasized that the researcher ought to be sensitive to the dual role of teacher and researcher and invite another school professional to collect action research data to minimize any possible coercion.

According to Ospina et al. (2004, p. 3) “acknowledging power dynamics, group participants must authorize each other to contribute their expertise to the service of the group, while at the same time agreeing to own their authority in making sure that those contributions are taken seriously”. In this regard, the researcher had to empower other group members to take and own decisions during the project. The students elected their student leader to take care of all their suggestions even outside class and would deliver them during discussions.

To ensure democracy in the research process, the researcher empowered students to organize consensus building meetings to agree on a set of rules around participation and every one had to note them down for future reference. All members had equal chances to participate in the research. All members’ issues were important for the progress of the project and decisions were made after agreement of all members. Much as the researcher was a teacher at the same time, her power difference in class did not influence the decisions taken during the project. The researcher became a participant at the same time and respected other members’ views.

The students’ status raised to participants and were free to contribute their views without influence from the teachers. As noted by Ospina et al. (2004, p. 3), “the democratic aspirations of action research involves developing authentic relationships over time and attending to the power dynamics within which they emerge”. In the same context, Nolen and Vander Putten (2007, p. 405) noted that there was need to establish a relationship between researchers and participants that is as democratic as possible. In doing so, the participants become part of the decision making process in all phases of action research. Consequently, the participants can comment on findings and together with the researcher develop more effective models of schooling.

The researcher respected anonymity and confidentiality of all participants throughout the project. The photographs that appear in the report were taken after seeking consent from the concerned. Where participants did not consent to using their photographs, the researcher respected their decision and did not have any adverse consequences. No photographs were taken during interviews in respect to respondents’ choice. Participants did not consent to use of video tapping to which the researcher adhered.

In this research, the real names of teachers have been replaced as “teachers” while as those for students have been collectively been referred to as “students” instead of individual names. The principals name has also been replaced with principal, there was no better title that could suite her. Besides, she also agreed to it since it was an academic research and was aware of the results after the submission of report.

During the consensus meetings held, we agreed to refer to student and teacher participants collectively as students and teachers respectively. This was because it would be quite easy to identify what each member said especially during data presentation. Since we had already identified the program for the students it was therefore ethical to refer to them collectively other than individually.

#### **4.8 Challenges**

Doubling as a researcher and a teacher at the same time was a bit challenging because I had to teach and at the same time collect data. However, the colleagues that I worked with played a very big role to ensure that I do not influence the findings.

Acquiring permission to interview the employer at Ntake bakery was quite challenging due the busy schedule at bakery and therefore I had to do the interview on the day the students had a study tour to the bakery. It became very hard to organize an appropriate space for the interview therefore he had to respond to the interview questions as the students toured the premises.

The rains also disrupted the project. It led to delays since we wanted to use dry banana peelings yet the rains could not permit this to happen. This led to longer periods of waiting for the banana peelings to dry.

Students and colleagues had less experience in filling logs. This delayed the whole process since I had to train them several times before the project could progress.

Being a new way of teaching and learning outside the normal classroom, students and teachers at times were overwhelmed by the number of people who turned up to find out what they were doing. In this way they spent a lot of time explaining yet we had limited time for that particular lesson.

Students found it had to adjust to working in groups. They had become accustomed to sitting in class, copy notes and later write exams. All they knew was that the teacher had all the authority to make notes and there was no need to consult their fellow learners.

This was evident when the male students wanted to work on their own. They believed there was marks allocation and therefore did not want to associate with others in order to perform well.

The demonstration kitchen where the students had to do their practical lessons did not have most of the equipment that could facilitate the project. We therefore had to improvise at all times that led to delays.

It was quite hard to estimate the quantity of heat from the briquettes as well as the cooking time. We therefore had to take chances and kept opening the saucepan to see whether the cake was ready.

#### **4.9 Summary of Chapter Four**

In this chapter, has presented a detailed discussion of the qualitative research design and action research approach. Information discussed in this chapter also included data collection tools, sample population, ethical considerations in research. The validity and reliability and how the researcher ensured that the measures taken to ensure that they were achieved was discussed. A key point to note is how the researcher controlled her powers to avoid influencing the findings from the project. According to Ospina et al. (2004, p. 3), “the democratic aspirations of action research involves developing authentic relationships over time and attending to the power dynamics within which they emerge”.

The next chapter presents the findings from the field with some of the theories earlier discussed in the theory chapter to give a theoretical backing to my actions. The findings are also presented in phases from planning as phase one and evaluation as the fifth and last phase.

## **CHAPTER FIVE: DATA PRESENTATION**

### **5.1 Overview**

This chapter presents the findings transcribed from observations, interviews and logs. The findings presented include that collected as students and colleagues participated in the project as well as that obtained from interviews. Since we conducted the project in phases, it was necessary to present the findings in phases to ensure that all information is presented. It also presents a description of how the activities in the phases occurred.

We carried out an action research project that with the major aim of improving the way teaching and learning was being conducted at UHTTI. According to (Hiim, 2003) in Hiim (2007, p. 100) refers to action research in pedagogy as studies that include systematic collaboration in planning, carrying out, evaluation and critical analysis of teaching and learning process, with the aim of improving and documenting new knowledge of teaching and learning processes in school and work life.

It was therefore paramount to involve all the concerned parties especially the students and colleagues in the pastry and bakery department. This was because they form the central part in the teaching and learning process. However, it was also necessary for the teachers to keep reflecting on the way they practiced their teaching profession. With this in mind, we employed Hiim didactical model of relations. This was because the model provides teachers and students with a set of common concepts, which can make it easier to cooperate in teaching and learning process. The main point of the model is to contribute to a systematic reflection on teaching and learning and to development and change of such processes (Hiim, 2007, p. 99).

It should however be noted that evaluation was done at the end of every stage in form of reflections by all the participants in the project. “After having accomplished a task, it is essential that learners evaluate the effectiveness and efficiency of the plan and their strategy use” Newby, (1996); Zimmerman, (2000a, 2006) in (Jossberger et al., 2010, p. 421).

Participants carried out the project in phases owing to the time we had since the students had other course units to attend. In each phase, data was collected using various data collection tools and is presented below. The phases include planning, collection and preparation of raw materials, production of briquettes, cooking with briquettes and evaluation of the entire process. The detailed description of how participants conducted the phases and the data gathered are thus presented below.

## 5.2 Phase One: Planning

In this phase, the researcher presented the major issues discussed during this phase. This was the idea of changing the way of delivering content about generation of energy from biomass. The topic included other subtopics among which was recycling kitchen refuse to generate a cheap and alternative energy source. In the previous year, a set of students (BCPB/2015), Colleagues and I participated in a project where we made briquettes. This was part of my third project at HiOA (MAYPH 4300, social perspective on vocational pedagogical work). In this project, I had a challenge to identify a pedagogical challenge at my work place and address it with my colleagues. After the future workshop, we agreed to teach energy use from biomass in a practical way possible as a way of making students active in class.

This project was successful though we noted the following: students did not make notes, there was no continuous assessment, the students did not write logs of what had happened and they did not get a chance to evaluate the teachers' roles in class. These were great observations however, the students that were to work on them had completed their course at UHTTI and therefore they were already in the field of work. Since their recommendations were good, we agreed to implement them but with a different group of students in the same department. With these students, we still had to consider their learning needs and preferences.

Draper; Sipe; Tice; Titmus in (Kerka, 2002, p. 3) noted that theories or perspectives on adult learning such as Andragogy make a number of assertions about the characteristics of adults. They noted that adults need learning to be meaningful, they are autonomous, independent and self-directed, prior experiences are rich learning resource, their readiness to learn is associated with a transition point or a need to perform a task; their orientation is centered on problems not content, they are intrinsically motivated, their participation in learning is voluntary.

After covering some content according to the planned curriculum, we therefore opted to teach the topic about generating fuel from biomass in form of project work. In this project, students participated actively in the teaching and learning process. After experiencing both teaching and learning modes, it was therefore necessary for the students to compare the two different modes of content delivery. This could also help the teachers change their attitude towards the teaching methods that they used.

With reference to Koschmann et al. (1996, p. 90), an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains. It therefore follows that to be effective teachers, it is necessary to involve learners in the teaching and learning process. The teachers' dominance in class should therefore be broken.

From Grabinger et al. (1997, p. 5) view, learners need to: 1) Determine for themselves what issues need to be addressed when facing a new problem [and] identify knowledge and skills they already possess that can be applied to the situation. [Learners need to,] determine which skills and knowledge areas are deficient and create learning plans to address those deficiencies [and therefore] create timelines and monitor their progress, apply what they know to problems that may change substantially from one moment to another. [They also need to] assess their performance and make changes in personal processes for use to meet subsequent challenges.

Considering the above theory about creating an active learning environment, it was therefore necessary for the learners to address their own problems in the teaching and learning process. The teachers gave learners enough time to determine the issues they needed to solve and in this case, it was recycling kitchen refuse to generate energy to be used for baking. They also had to share the knowledge that they already had about the subject matter and this formed a basis for their learning. Some learners had knowledge about briquette making though it was from different materials.

They also identified which skills they really needed. In this case, their major issue was how to bake cakes especially in areas where the supply of electricity is limited and to reduce costs when baking. Students applied the knowledge they already had about briquettes to make a variety of them and finally evaluated their products against the standards that they had set by themselves. In addition, considering the major objective of the research, it would be hard for the students to write logs about their learning, evaluate their learning and to create knowledge on their own.



When we considered the time, amount of money, learning resource and the raw materials available, it we agreed that briquette making was the best project to carry out. It could also be a way of disposing off refuse from the kitchen as well as improving the hygiene of the kitchen.

According to Bereiter and Scardamalia in (Tynjälä, 2008, p. 145) it is through problem solving that formal knowledge acquired in education is transformed into an experts flexible informal knowledge. The process of integrating theory, practice and self-regulation can be seen as a problem solving process where students simultaneously need to solve practical problems and related conceptual problems that is problems of understanding. “As a result instead of traditional forms of delivering knowledge, problem solving tasks should form the core of education of skilled workforce”(Tynjälä, 2008, p. 145).

It therefore followed that in making briquettes, we would be solving many problems, which included, conserving the environment as well as generating a cheap source of fuel. This project therefore gained more popularity because it would not only engage learners but it would also help them assess the way they dispose refuse at their homes.

Amoor, (2011) in (Ayeni, 2015, p. 103) noted that vocational education is the core of both the individuals and society’s economy. In the course of acquisition of skills, individuals could discover their environment or surroundings and harness the resources within it, which could serve them since the wealth of the society determines largely the development of such a society.

During the planning phase, members took up various responsibilities. Participants also set the rules to govern the project. The meeting took about an hour and all the eight students and the three teachers and the principal of the institute were present. To emphasize students’ participation in class, the students democratically elected a one of the students to act as a secretary to that meeting. The student (secretary) was responsible for writing the minutes from the various meetings held throughout the time of the project. Student leadership was also emphasized therefore one students to lead the others during the project.

Democracy was key during the planning phase. Members had equal rights during the meeting and teachers’ powers did not influence students’ ideas. Participant made decisions consulting all members and they had to agree unanimously without affecting any member. According to Reason and Bradbury (2001, p. 18) all participants have the same status in the dialogue arena, Some of the experience the participant had when entering the dialogue must be seen as relevant and it should be possible for all participants to gain an understanding of the topics under discussion

Following the above guidelines, we agreed on the following issues:

After seeking their consent, all the eight students in that class agreed to participate in the project. During the meeting, students agreed that they needed marks awarded to show that they had participated in the project. Since students had not yet done their course work we agreed that the marks obtained from the project would contribute to their course work mark at the end of that particular semester.

Student leader was not only responsible to take care of all the raw materials but also headed student discussions. A secretary also noted what participants talked about during the meetings held. Students also identified the different duties that they distributed amongst themselves. These included collecting raw materials, monitoring the briquettes and ensuring that all students participated in the project.

The roles of each participant in the project were stipulated to ensure effective learning and equal responsibility in class.

The teacher's roles were spelt out in accordance to the suggestions made by Soparat et al. (2015, p. 15) 1), they included the following: knowing, the teacher must have knowledge to provide but also help learners to construct their own knowledge, facilitating: the teacher is a supporter and facilitator for learners' needs. [The teacher has to do] context providing: teachers provide appropriate classroom settings which contain learning resources, learning tools and media and social context for learners to work collaboratively [and finally the teacher has a duty of] assessing: the teacher prepares assessment tools which reflect the performance assessment and follow-up of learners' progress.

We also unanimously agreed that students were to collect information about how to make briquettes that they were to discuss with their fellow students and agree on one procedure that we used during the project. They were also to collect their raw materials from the institute kitchen and prepare them under the guidance of the teachers.

We also agreed that students write logs whenever we carried out the project reflecting on what had happen that day and recommend better ways of doing them. This was followed with immediate feedback from the teachers and students. G. Brown et al. (2013, p. 4) noted that the purpose of feedback is to help a person to improve what he/she is doing. It follws that the feedback has to be useful and acceptable by the reciever. Therefore feedback has to be specific, accurate, timely, clear, focussed upon attainable and expressed in a way which will encourage a person to think and if he/she thinks that it is necessary to change.

There was also need to assess each step of the project through reflecting on what had happened noted that through reflection on their learning and work experiences (together with peers, teachers and trainers) students gradually develop an autonomous work attitude and vocational habitus. Learning activities like integrating, generalizing and articulating are expressions of reflective learning (de Bruijn & Leeman, 2011, p. 698).

We also agreed to have our project outside the usual classroom since the space and equipment in the demonstration kitchen were not enough to cater for the project. We also did not want to inconvenience other students since they had their practical lessons at that time. There was also need to show other people in the institute that our project was all about and to make students be able to explain what they were doing to a different audience other than their usual teachers.

It therefore follows that the colleges purpose is not to transfer knowledge but to create environments and experiences that bring students to discover and construct knowledge for themselves to make students members of communities of learners that make discoveries and solve problems (Barr & Tagg, 1995, p. 15). To create an environment that encourages learners to value their own efforts, it was necessary that students share knowledge amongst themselves.



*Figure 4: Shows one of the students summarizing what we had discussed in one of our meetings*

In the photograph above, one of the students was trying to remind fellow learners about what we agreed on in one of the meetings held. He took over the work of the teacher that further explains that students have many skills that teachers need to consider during the teaching and learning process.

### **Observations and reflections made during the planning phase**

All the participants made the observations and reflections that they wrote them in logs. Participants discussed the information written in the logs at the end of every phase to evaluate the phase in order to find out whether we had achieved what was earlier planned. It was also a way of giving feedback to the participants. The students had to write personal logs that they later discussed amongst themselves and came up with one log that they discussed alongside with what teachers to avoid students repeating similar observations.

As noted by G. Brown et al. (2013, p. 4) The purpose of feedback is to help a person to improve what he/she is doing. It follows that the feedback has to be useful and acceptable by the receiver. Therefore feedback has to be specific, accurate, timely, clear, focussed upon attainable and expressed in a way which will encourage a person to think and if he/she thinks that it is necessary to change. This was the major reason why we had to get feedback immediately after the lessons.

From the teachers, the following observations were made.

The planning stage went on successfully and at the end, we had a clear idea of main details of the project. Some students came late; the reason they gave was they thought there was no lesson that day. This is because we had covered most of the work in the syllabus.

Students also exhibited a high degree of willingness to learn through project work and were very excited to participate.

Some of the students felt shy to express themselves especially when the principal of the institute was still around but when she left, most of them felt very free to speak.

It was a bit challenging to fill logs especially for students. It was their first time to try them out in their entire life. They felt very excited to fill though they did not know how to fill them.

Teachers also observed that students still expected to do a theory test in addition to the project. They kept asking if they needed to do another theory test after the project.

Students had great ideas about the project and were willing to share them with their fellow students. They actually organized the venue for the meeting and noted all that the participants said during the meeting. They also set rules that governed their activities. They also wrote down the sequence of procedures to follow when executing the project. They divided roles amongst themselves and simply informed the teachers of what they had decided as a group.

From the logs and observations that students noted, the following information emerged.

There was need to look for information about making briquettes. It was no longer the teachers' role to provide notes to the students.

Choosing a student leader to manage students' activities and raw materials was good although the teachers still chaired and controlled the meeting.

Some students were not free to speak before the principal and other teachers, they feared to express themselves. This was new; they were only used to listening to teachers and not sharing information with them.

There was need to allocate duties to the different students though all the work was done as a group. It was necessary to attend throughout the project since assessment was continuous.

It was good for the students to evaluate the teachers too; we believe they need it too provided they do not base on that information to give us low marks.

It was hard to fill the logs; participants therefore needed more training done.

If possible, the school administration could plan a visit/tour to one of the briquette making factories or people to gain skills.

Students needed to know whether project work would be part of the accumulated marks at the end of the semester or there was no mark at the end of the project.

It was good to integrate hygiene (refuse disposal) with energy conservation as course units to know their application in the field after school.

Considering the observations noted from the planning phase, it was therefore necessary to work on them before the next stage could commence. They also provided the foundation of what to do in the next phase.

### **5.3 Phase Two: Preparing Raw Materials**

Before starting this phase, participants addressed the issues raised from the previous phase. This is because they affected the output in this phase. Considering the fact that it was an action research project, actions in the previous phase greatly affected those in the subsequent phases and therefore successful completion of one phase led to the next phase.

The researcher did training of students and teachers to fill the logs.

There was need to give students more authority to work independently without teachers interfering much. Teachers therefore empowered students to chair all the preceding meetings that were held. They also had to secure their preferred place where they executed the project

With the idea that teachers could use students' evaluation to award them low marks, teachers made it clear that the results were aimed at improving the way teaching was done to improve the quality of graduates. This therefore led to less biased results.

The idea of taking students to a factory of briquettes was not possible since their trip to Ntake bakery was yet to take place shortly after the project. Considering the time that was available, it was not possible to arrange one. It was also a good idea for the students to create their own products before looking at what was in in the market.

We agreed that the assessment done during the project would accumulate the marks for the coursework instead of the usual theory exam. This increased the students more morale to participate in the project since they expected a mark at the end.

After working on the issues raised in the previous phase, the participants were now ready to work on the preparation of raw materials.

In this phase, learners made the raw materials ready for use. Throughout this stage, learners and teachers engaged in a discussion to find out their views about vocational education. It was also necessary to know whether they enjoyed what they were doing.

In the photographs below, top two photographs show students crushing and sieving banana peelings. They were also trying to explain their actions to one of the staff members at the institute. As noted in the photographs, students were very happy and a little free compared to what used to take place in the classroom. The first lower photograph shows a student trying to sieve charcoal remains to get the fine particles used to make briquettes. The next lower photograph shows mixture of cassava and wheat flour porridge used as a binder for the briquettes.



*Figure 5: Shows students preparing raw materials for briquettes*

In this phase, students wrote logs about the experiences they went through as they made the raw materials ready for briquette making. The raw materials used to make briquettes included banana peelings, cassava and wheat flour, charcoal dust and water. As the students worked on the raw materials, observations were noted. The information gathered from the logs and the observations made that I have described below.

**Banana peelings:** Students obtained them from the hotel main kitchen. Normally after peeling the matooke, the peelings are thrown away as rubbish. They normally rot away and produce a bad smell. The institute pays Jinja municipal council monthly to collect garbage from the institute. To obtain the banana peelings from the kitchen, the student leader had to talk to the person in charge of the kitchen so that they reserved them for our class.

Ideally, the teachers could do this but students had to experience it in order to learn how to communicate with different authorities in the institute. According to the students, it was necessary to sort the banana peelings to remove the bigger pieces and any other unwanted materials. Students agreed to sort the banana peelings during the discussion they had on how to effectively manage the drying period of the banana peelings in consideration of the time they had beforehand.

After sorting the peelings, they had to dry them before using them to produce briquettes. This process took about two weeks. This was because unexpected rain interrupted and disorganized the entire program. The activities of the hotel gardener also challenged this process. Students usually spread the banana peelings in the compound. Whenever the gardener would be doing her general clean up, she would remove all the peelings thinking it was rubbish.

Two bunches of the peelings were lost before realizing that it was the gardener who had removed them. After realizing it, the student leader talked to her and she gave them an appropriate space to dry the banana peelings.

Students also observed that as they worked on the raw materials, they encountered many challenges but somehow they managed to solve them in order to achieve what they had planned. Largely, learners acquired problem solving techniques and thinking abilities and learnt to create their own knowledge. This was in line with Grabinger et al. (1997, p. 6) who suggested that the instructional activities in which learners need to be engaged should require them to take personal and active roles in all aspects of knowledge construction and problem solving processes. A learning environment that places learners in the driver's seat of the learning process- involving them in planning, controlling and directing of learning activities and the application and assessment of the learning processes and outcomes.



After the banana peelings had dried, students had to crush them into powder form. At first, they had planned to use a blender or a specialized machine to crush them. However, none of equipment they wanted was available. In a bid to get a solution, we agreed that the project was to be carried out with minimum resources available therefore using the blender and a specialized machine could incur more costs. During students' discussion, they realized there were equipment in the demonstration kitchen that they could use. These were the rolling pins and the sieve. They therefore used the rolling pins to crush the dry banana peelings and the sieve to separate the big particles from the small ones that we actually needed. The teachers however guided them during the discussions and helped them analyze each equipment that they had chosen to use in this phase.

**Charcoal Remains:** These were also collected from the institute kitchen. Normally the cooks use the bigger charcoal pieces for cooking and the small charcoal with charcoal dust is left behind. So far, there was no particular way to dispose it off. It was normally hipped in one of the stores with the sacks of charcoal.

It was therefore rendered useless because it could not be used in the big charcoal stoves. The students followed the same procedure to acquire the charcoal remains as it was for the banana peelings. The charcoal remains were also collected and sieved to obtain the charcoal dust.

**Cassava flour and waste baking flour:** The mixture of cassava and wheat flour acted as the binding agent to hold other raw materials to form briquettes. Students collected the cassava and baking flour from the demonstration kitchen after the practical lessons. Students usually used this flour to dust rolling pins and working surfaces as they made pastry products. The flour was also sieved to remove the unwanted particles and mixed evenly and porridge made out of it.

Students cooked the porridge by dissolving the flour in cold water before adding it to boiling water. After adding it, the mixture is stirred to ensure that lumps do not form. It cooked for about 30 minutes to make it a little sticky. After cooling, students used it as a binding agent for the briquettes.

## **Reflections made from this phase**

Reflections in this phase were made by both the students and the teachers and were intended to discuss how the phase was conducted, find out the challenges experienced and therefore try to find solutions before proceeding to the next phase. It was also necessary to evaluate the phase to ensure that participants followed the plan. Discussions about the same followed in order to get views from all participants.

Brookfield and Preskill (1999) in Jakubowski (2003, p. 26) noted that discussion has the following values; 1) to help participants reach a more critically informed understanding about a topic or topics under consideration. 2) to enhance participants' self-awareness and their capacity for self-critique; 3) to foster an appreciation among participants for the diversity of opinion that invariably emerges when viewpoints are exchanged openly and honestly and 4) to act as a catalyst to helping people take informed action in the world.

At the beginning of this phase, the male students did not want to participate especially during preparation of the banana peelings. This was partly because they wanted their own group and therefore did not want to work with the female students. The student leader had to play her roles of explaining to them the importance of working as one group instead of small groups. After their discussion, the male students later accepted to participate. As a result, they were able to work.

Students also suggested that it would be healthier for the teachers to divide them into two groups each comprising of four students. This was because they released that some members were not participating as expected. Students also noted that the mode of teaching was far much better than sitting in class. They also preferred to write their own notes the way they would understand them. Teachers' notes were always confusing them and it was very hard to read them. They also noted that those who had been dodging class were now attending promptly.

Students noted that teachers did not interfere with their work this time. The teachers only intervened to help them when required. They consulted teachers after discussing amongst themselves and would only inform the teachers on what they had agreed as a group. This was noticed when they decided to use the rolling pins to crush the banana peelings. This was very creative and cheap. It also showed that students could think critically before taking a decision.

This was also in line with Soparat et al. (2015, p. 15) who noted that; the need to know by students; students see the need to gain knowledge, understand concepts and apply skills in order to answer the “driving question” and create project products, beginning with an “entry event” that generates interest and curiosity.

Teachers noted that students applied leadership skills and learnt to be responsible for their learning. This was realized when they had to obtain raw materials from the kitchen on their own. The teachers’ role was to direct them where to obtain them instead of picking the raw materials on their behalf. In this way, they learnt how to communicate with others especially people ahead of them in a higher administrative level.

Students also noted that they learnt through experience, especially when they spread the banana peelings and did not find them later in the day. This happened twice during the project. They felt so disappointed since they had not planned this before. During the discussion, students suggested various solutions including dodging other lessons to take care of the banana peelings, abandoning the project and using only charcoal dust.

However, students in the previous project had experienced in the previous project but teachers chose not to tell students. They therefore had to experience it as part of their learning. As noted by Downes (2010, p. 28), We need to consider learners not only as the subjects of learning , entities to whom we deliver learning content but also the sources of learning , functioning as the perceptual input for a wider network.

Students worked as a team, observing and monitoring activities of all the team members. Where a member did not work as expected, the student leader cautioned them and work resumed as expected. This was a very good attribute to the group because the teacher did not have to keep monitoring the students to make them learn. Students had a chance to learn on their own and to teach themselves without the teacher being very active. Through log writing, students were able to evaluate their own work and to evaluate the importance of the teacher in class.

As the project progressed, students made their own notes. The teachers did not have to read notes to the students therefore teachers role was to facilitate and provide an appropriate environment for learning to take place.

Students also noted that it was very good to work on their own. Though the teachers were present they actually opted to first consult their colleagues and where the colleague had no concrete answers, they came to the teachers for consultation.

According to Illeris, (2002,2007) in (Poortman et al., 2011, p. 269) identified six social interactions during learning as; perception, transmission, experience, imitation, activity and participation. In reference to the project, I chose to apply two of them. In perception, the learner may register information by observing or hearing colleagues in his/her vicinity and when the learner is actively listening, taking notes or otherwise processing information, then this is transmission. The learner gains experience when he/she tries out performance under the guidance of a mentor, teacher, workplace instructor or a regular colleague (Poortman et al., 2011, p. 269).

Teachers observed that students appreciated working from outside the “normal” classroom environment. This was because they were very free to express themselves in a freer way. With reference to figure 5, it is evident that students are happily enjoying what they were doing. They also engaged in explaining what they were doing to other members of the institute. In this way, I feel they developed confidence in themselves and in what they were doing. They also had to learn how to communicate with other people, which developed their communication skills. In this teaching environment, there was need for students to think very fast because they had to explain to other people in the institute about what their project and the products. In most cases, the people who visited them had no or very little information about the products. They also had to make sure that the products were good because it would raise criticism from other people, yet they wanted appraisal since it was a new project in the institute.

Teachers and students noted that, the criticism they got from other members gave students alternative ways of making their products. They also got more information from the different people who viewed their products. This gave them more encouragement and acted as a mode of assessment to them to make better products. A case in point was a member of staff who asked them why they had used banana peelings instead of other kitchen refuse.

Students had to think and finally came up with good answers like; they take a shorter time to dry, bananas are consumed almost on daily basis and therefore if we wanted to solve the problem of refuse, it was necessary to work with what needed immediate attention. This meant that the raw materials for the project were readily available at no cost. In addition, it was a form of clearing rubbish from the kitchen. From the teachers’ logs, this is what they noted about this kind of teaching and learning especially at the end of this phase.

“Teachers learn to appreciate learners learning differences. Since learners plan and evaluate their own learning, it is hard for them to claim that teachers did not teach them well. They are therefore responsible for the outcome of their activities. It was good to work with students in a group especially when making objectives and assessment”.

From the interview I had with the principal of the institute, this is what she had to say about actively involving learners in the teaching and learning process.

“About active teaching and learning, this is what we should emphasize, I feel students need more time to work together as a group. This business of spoon feeding students is not good. You need to allow them to think and collaborate with their fellow students and to learn from each *other*. Some of those students already have experiences from the field where they work. They can help others to learn by sharing their experiences”.

Her view was in line with (Grabinger & Dunlap, 1995, p. 10) who noted that Learners bring their own needs and experiences to a learning situation and are ready to act according to these needs. We must incorporate these needs and experiences into learning activities to help students take ownership and responsibility for their own learning.

From the interview conducted with the employer at Ntake bakery, this is what he noted about group work and actively involving learners in the teaching and learning process.

“Active learning is a good idea because students interact with others and as a result they learn from each other. It is actually good to teach them in groups because when they come here in the factory, we group them in different sections and they work together, therefore if schools can train them to work as a group it makes our work very easy”. Students also need to learn other skills in addition to the technical skills in their area of specialization. These skills include marketing and selling of the products that they make, ability to start up their own businesses, and also solving problems”.

This further emphasizes the fact that collaboration is not only important at school but also appreciated in the work place. In the same context, Ertmer (2015, pp. 8-9), emphasized that collaboration is essential in the world after school because most learners can find themselves in jobs where they need to share information and work productively with others. This means that in addition to vocational skills, students also need communication and collaboration skills, acquired through active learning.

At the end of this phase, the following challenges were identified and therefore the need to work on them before continuing to the next phase.

Male students did not want to work with the female students in one group so they suggested that the group of eight students divide into two groups. This was not possible because there were three boys and five female students. It therefore meant that one group would have more boys and another with more female students. However, the student leader intervened and later the boys agreed to work.

There was also need to secure a safe place to keep the raw materials and later on the products. Students identified a store near the demonstration kitchen but had to talk to the person in charge before accessing it. This was because rain could disrupt or spoil the products. The student leader secured the place and the raw materials were stored appropriately.

Managing time was a big challenge to the students. Students spent a lot of time on just one activity especially when explaining to other members of the institute. Therefore, students agreed that time management was part of the assessment criteria and therefore for those who wasted time, the student leader usually cautioned them. Working as a group was still challenging them to a certain extent, some students preferred to work with certain people and others still wanted to get more marks than others did. However, when they realized that assessment was for the entire group, they embarked on working as a group.

#### **5.4 Phase Three (3): Production Process of briquettes**

In this phase, the challenges experienced in the previous phase participants immediately solved them after the phase therefore; there was no need to solve them before the start of the next phase. Students had to work as one group but with different responsibilities. They therefore worked with the already prepared raw materials to make briquettes.

During this phase, the theory from (Mwampamba et al., 2013, p. 158), was considered. He defines briquetting as the process of converting low bulk density biomass into high density and energy concentrated fuel. Cohesion is achieved by low-pressure agglomeration with the use of binders, medium pressure compaction with a lower binder percentage or high-pressure compaction with little or no binder.

During the production phase, it was also necessary to consider Njenga et al. (2009, p. 1), who noted that Production of fuel briquettes involve the collection and compaction of a combination of combustible waste materials that are not directly usable because of their low density and processing them into a solid fuel product of any convenient shape that can be burned like wood or charcoal. This therefore meant that there was need to ensure that the raw materials used had the desired qualities.

The picture on left (below) shows students as they mixed the raw materials to make briquettes. It also shows a sample of the molds that learners used when compacting and shaping the briquettes. The picture on right shows some of the briquettes before they dried.



*Figure 6: Showing students as they made briquettes and some of their first briquettes they made*

As the production phase progressed, the students, teachers made observations and wrote logs to indicate what had happened during the phase. The information from logs and observations is summarized below. In this phase, the participants had developed more skills in writing logs and making observations and therefore they provided more detailed and clear information.

To make the briquettes, students added charcoal dust to the sieved banana peelings and mixed them very well. They later added the cold binding agent (mixture of baking flour and cassava porridge) until a stable mass was formed. This was later compacted and shaped using the molds that the students had made. Students took care during compacting in order to reduce the quantity of air trapped. As noted by (Olivier, 2010) in (Ngusale et al., 2014, p. 754), in briquetting operation, the entrapped air must be dispelled to avoid making a spongy or loose briquette. A spongy briquette deteriorates in storage and does not exhibit desired results from the standpoint of the briquette being a long burning and efficient fuel.

Much as we had agreed to make briquettes from banana peelings and charcoal dust, students created more products. They made more briquettes from soil and the bigger banana peelings. When I asked them why they had made them, their answers were very amazing. One most outstanding answer was that they wanted to create a variety in the products made. There was also need to dispose of all the refuse, leaving the big banana peelings would render the project unsuccessful. As earlier noted, the students worked on their own and the teachers' role was to facilitate the learning and to also to provide a conducive learning environment.

Teachers guided the learning and learners consulted them where necessary. According to Stevenson, (1994) in (Kerka, 1997, p. 5) the vocational teacher's role is not to set tasks but to organize experiences that allow learners to develop their own knowledge and understanding therefore since the focus is on the learner, vocational education should be conceptualized as a learning process not a teaching process.

At the beginning of the phase, the student leader distributed of responsibilities to fellow students with the help of the teachers. Students still had to work as one group with different responsibilities. The responsibilities included collecting raw materials, mixing the raw materials, shaping the molds, keeping the products and monitoring to ensure their safety. The importance of group work was also appreciated by Shakarian, (1995) in Faust and Paulson (1998, p. 12), who noted that "when students work in groups, they have the opportunity to state their own views, to hear from others, to hone their argumentative skills and so forth, without the administrative requirements of group work".

Participants noted in this phase that, there were many challenges. This was because most of the equipment that we had planned to use were not available especially tables. Students had to do a lot of bending when making briquettes. Participants attributed it to poor planning because they did not take into consideration during the planning phase. With reference from figure, six, two students were working while bending which made their work quite hard. However, it did not stop them from working. With time, they sought solutions and later worked quite well with the tables.

The other equipment that was not available were the molds from where the briquettes were to be compacted. Ideally, the already made molds were to be bought by the institute, but this did not happen. Therefore, the students had to create more knowledge on how to shape their products. Providing molds would also make the work very easy and yet students needed to think before making a decision.



As students tried to get a solution, they came up with several ideas that included the following; rolling out the briquette “dough” and use pastry cutters to shape them, another student suggested that they use hands to mold them; another suggested that they make one big briquette without cutting it into small pieces. Learners discovered these ideas during the discussions they had during the production process. However, students evaluated each suggestion as follows:

“We realized that rolling the briquette “dough” was time consuming. The fact that we did not have tables, it was hard to roll it. Using hands was also time consuming and briquettes would not be of the same size. Making one big briquette was good but it would take long to dry, take long to light it and worse still, it would not fit into the charcoal stoves that we had. Besides it would limit the efforts and creativity of the different students”.

After evaluating all possible solutions, the teachers guided learners through the demonstration kitchen and students further identified more refuse that needed to be disposed of. These included empty tins which earlier contained spices. Most of them were laying idle in the kitchen without any use. After removing the spices, the tins had no use other than disposing them of into the rubbish pit. Students obtained the plastic tins, cut them into rounds and later used them to mold/compact their briquettes.

Tynjälä (2008) in Gijbels et al. (2010, p. 1), noted that in today’s rapidly evolving society, we are confronted with an exponential increase in information, growing need for innovation and the requirement to develop sufficient skills. Schools, enterprises and players in the field of training are faced with the challenge of finding, valuing and further developing every talent. The high level of competence and innovative capacity on which the economy is based are strongly determined by the development and training which employees have under gone.

In the context of the project, there was need for innovation, creativity. The students had to solve the challenges that they experienced using the resources that were available to them. They however exhibited most of these skills. During compacting, the students also noted that to make the briquettes come out of the molds with much ease, they had to wet the inside part of the molds before adding the briquette “dough”. The challenges that students met as they made the briquettes created a multitude of experiences during the teaching and learning process.

In the same context, Schank, Berman, and Macpherson (1999), we are likely to remember our experiences than isolated information; therefore, this makes sense to teach students by providing them with rich experiences in which they desire to perform skills in order to accomplish motivating goals. The way in which they practice the skills should closely relate to how they will use the skills outside the learning environment.

After making the briquettes, students had to dry them. Students noted that when briquettes would break when spread under the sun. They therefore had to spread them in the store to prevent cracking. The briquettes dried for one week to eliminate moisture that would cause a lot of smoke when briquettes burnt.

Students also made a variety of briquettes including those from soil without cassava flour as the binding agent. They also made briquettes out of the uncrushed banana peelings and bigger charcoal remains. This was not only to dispose of all the kitchen refuse but also to compare the cooking qualities of the different briquettes. This was something we had not incorporated in our work plan but because of the students' wealth of knowledge, they had to think and create new ideas. We attributed this to the freedom they had to decide on what they wanted to learn instead of the teacher deciding for them.

### **Reflections made from this phase**

Both the teachers and students made the reflections. The reflections were in line with the idea of making briquettes and the teaching and learning process. The purpose of reflections was to help participants to evaluate the phase and come up with an overview of how the phase was conducted, find out the challenges experienced so that they are not carried to the next phase.

As noted by Ertmer and Newby, (1996); Fowler, (2008) in (Jossberger et al., 2010, p. 421) Evaluating their process and reflecting on experience can increase learning from actual experiences and can eventually be used in future”.

As part of students' experiences during this phase, they noted that;

“At first we thought we were to use complicated equipment to make the briquettes but we were surprised that we used simple things that we had in the demonstration kitchen. In this project, we have also learnt to work together, solve problems and make our own notes. Working as a group was another good idea because some people had good information that they shared during group work. This could not happen if we had worked as individuals”.

Teachers noted that Learners enjoyed working with challenging activities. Challenges made them to think faster to find solutions to the selected challenges. Solving a problem entailed thinking critically and evaluation of the possible ideas generated. According to Koschmann et al. (1996, p. 90) an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains.

Learners also have a wealth of knowledge that when given the right classroom environment, students share this kind of knowledge with their fellow students. A key point to note was realized when the briquettes had refused to come out of the molds and a learner brought the idea of moistening the tins before adding the briquette dough. The student gained this knowledge when she made clay bricks in their village before coming to UHTTI, Jinja.

In this phase, students felt a little free to express themselves in the language they felt appropriate. Many times, they explained most of the work done in their local language. They did not know how to speak English fluently and therefore found it hard to speak freely in class. Therefore, while in class instead of speaking bad English, they would simply keep quite or dodge class and later copy notes.

Participants noted that the three different types of briquettes that students made had varying periods of drying. Those made of soil took the longest time to dry which was about two weeks. Those from banana peelings powder and charcoal dust took about a week and those from uncrushed banana peelings and bigger charcoal remains took the shortest time to dry. The drying time however was delayed by the weather and the sizes of the briquettes made.

From the interview conducted with the principal of UHTTI, Jinja, she noted the following about making briquettes at the institute.

“This could be a good idea if they were produced at a large scale. If we get another cheaper source of energy, students will become more active because they will have more time to practice what they would have learnt. Actually briquette making is another skill that make graduates from UHTTI different from others”.

From her perspective, it follows that briquettes have a potential as an alternative source of energy for the institute to facilitate practical lessons. As noted by Yaman et al, 2000; Olorunnisola (2004) in (Emerhi, 2011, p. 237) briquette making has the potential to meet the additional energy demands of urban and industrial sectors, thereby making a significant contribution to the economic advancement of developing countries. Besides, briquettes have advantages over fuel wood in terms of greater heat intensity, cleanliness, convenience in use and relatively smaller space requirement for storage.

Students solved the challenges met in this phase as they appeared to ensure that the products were made. Students also monitored the drying of the briquettes to ensure that briquettes were ready for use. The fact that some students already had knowledge about making briquettes it was appropriate for them to guide other learners in the monitoring of the drying process of the briquettes made. This therefore meant that if the briquettes did not dry well or break during drying, there would be no briquettes to use for cooking.

#### **5.6 Phase four: Cooking with Briquettes**

In this phase, the briquettes made in the previous phase were used to cook the cakes. Comparison in terms of how long they took to light; how long they took to completely burn. The figure below show the oven created during the project to cook cakes, a student trying to remove the oven from heated briquettes and a sample of the cakes cooked using heat from briquettes.



*Figure 7: Showing how students used briquettes to bake cakes*

As earlier noted, students and teachers made observations during this phase too. Participants wrote logs to reflect what had happened during this phase. It was necessary to establish how well the phase was done and to get the students experiences in the teaching and learning process. The following information was generated from the logs and the observations made by both teachers and students.

In this phase, students still experienced quite a number of challenges. The greatest challenge was unavailability of a specialized oven that uses briquettes as the source of heat to bake. We earlier planned to acquire it from the school but it was not possible. The students, colleagues and I had to think of an alternative way of baking the cakes. It was also necessary to measure the quantity of heat generated by briquettes but this was also not possible to measure that day. The only issues we measured were the briquettes ability to cook the cake, the time it took to cook and the ability to burn.

To bake the cakes, students aligned the briquettes in the charcoal stove and set them on fire with the help of old newspapers. Participants created an oven to ensure that the cakes could cook without losing the heat generated. To achieve this, a saucepan with heavy material and tight fitting lid acted as the oven. These would retain the heat for quite a good period. The saucepan was half filled with a mixture of ash and charcoal remains, which prevented the cake tin from getting into direct contact with the heat from the charcoal stove.

To ensure balanced heat supply, students spread some already lit briquettes on top of the cover of the saucepan. This also ensured that the cake could cook evenly and brown on top. The heat generated from the lit briquette was sufficient to cook the cakes in quite a shorter time than expected. Ferguson (2012, p. 7) in comparison with charcoal, they generally burn for longer and have a more consistent heat output, which is preferred by certain market segments such as restaurants, hospitals and schools.

After cooking the cakes with briquettes, students and teachers examined the products to find out whether the cakes were ready, to check whether cakes baked with briquettes were different from those cooked with electric ovens. Students however noted that:

“There is no difference in the texture, color, and taste of the cake. It takes a very short time to bake a cake using briquettes. The heat was too much and therefore care should be taken when filling the charcoal stove with briquettes to avoid too much heat. It is very hard to reduce the quantity of briquettes especially after lighting them, they just break and when they break, no more heat is produced”.

Students noted that briquettes burnt without release of smoke and generated a lot of heat that baked the cakes. This therefore was a great environmental concern. This means that cooking with briquettes is very healthy and does not pollute the environment.

Considering the raw materials that we used to make them, it is also a contribution to conserving the environment and Uganda's forests. Recycling kitchen refuse does not only improve the hygiene of the kitchen but also saves the institute the costs of disposing of the refuse. It also improves welfare of the people involved. They can sale the briquettes for cash and therefore improve their income.

### **Reflections during this stage**

Students were a little disturbed when briquettes took long to light compared to the charcoal they normally used at their homes. After successfully lighting them, they felt very happy and motivated as well. However, they suggested that instead of using old newspapers, it would have been better to use already lit charcoal from the kitchen.

Students worked as a group with common interest and were always accountable for whatever they did. A case in point was when the briquettes took too long to light, they started to question whether the person lighting was doing it the right way or they had made a mistake while processing the briquettes. Teachers were consulted whenever need arouse especially while setting up the "oven".

From the interview conducted with the employer at Ntake bakery about using briquettes to cook, his response is summarized below:

"We actually use briquettes to do most of the cooking. We make them here, initially we used firewood, charcoal to fire most of our ovens but because of the high costs, we had to embark on briquettes. They are environmentally friendly and have helped us dispose of the charcoal remains we had. I think students should be taught most of these skills so that they do not find problems in the field after school"

From his view, participants noted that briquettes are already in use at the students' future work places yet the school had not yet started to teach students such skills. However, from the observations made when baking, it was also noted that a lot of heat was generated which led to the cracking of the cakes.

This also shows that briquettes produce a lot of heat and therefore if this technology was embraced, practical lessons at UHTTI would not be paused especially when there is load shading.

## 5.7 Phase Five: Evaluation

In evaluation phase, participants consolidated all the reflections from the different phases as noted by teachers and learners to evaluate the entire project. Both the learners and teachers participated in the evaluation phase. Evaluation was done to establish whether we had achieved what we earlier planned. The method of teaching used was evaluated to find out whether it encouraged active learning, ability to solve problems, create and share knowledge and skills. The teaching and learning process, the idea of briquette production were also evaluated in line with the problem statement.

From students' logs and observations about their learning, this is what they summarized at the end of the project.

“We need to learn through projects if possible. We came to HTTI to learn skills to help us improve our lives especially in terms of income and baking. We have also learnt to be responsible for our own learning because we were able to make briquettes without too much influence from the teachers. We had to use our own knowledge and experiences to come up with the products. At first the course unit seemed very hard but after the project I feel I need to try out briquette making at home”.

From this perspective, it follows that students appreciated the mode of teaching that teachers used to deliver this particular content. The idea of actively involving learners in the teaching and learning process was contrary to the traditional ways of teaching where the teachers form the central part of learning. Traditional methods of teaching have a disadvantage as noted by Berryman (1991, p. 2) who noted that control over learning in the hands of the teacher undercuts the students' development of cognitive management skills, including goal-setting, strategic planning, monitoring, evaluating and revising-capabilities. Students develop no confidence in their own ability to learn or in their own sense making. Their abilities and opportunities to learn from experience are highly constrained.

Students also noted that involving them in the assessment of their own work as well as that for the teachers was very important. This did not only help them to communicate freely with the teachers but also improved the teachers' abilities to teach in a more democratic way. In the end, students appreciated and owned the marks that we acquired at the end of the project. Assessment of learners by teachers was through learners' activities during the teaching and learning process instead of texts that only encouraged cram work and reproduction of teachers notes.

In the same context, CTGV, (1993c) in (Grabinger & Dunlap, 1995, p. 10) assessment of students must take more realistic and holistic forms, utilizing projects and portfolios and de-emphasizing standardized testing. Educators are increasingly aware that conventional achievement and intelligence tests do not measure the ability of people to perform in every day settings and adapt to new situations. Learners also evaluated their teachers in relation to the teaching and delivery of that particular content in relation to what they had learnt earlier. This involved learners analyzing the role of the teacher in class and how he/she influenced the teaching and learning process.

According to the students, “teachers played a good role during the teaching and learning process. It was necessary for the teachers to leave the students to first work on their own. This encouraged us to think and to make decisions. When teachers do everything in class, we feel lazy to make our own notes and sometimes fail to attend lessons”.

As noted by , (Downes, 2010, p. 28) We need to consider learners not only as the subjects of learning , entities to whom we deliver learning content but also the sources of learning , functioning as the perceptual input for a wider network. According to Aakre (2009, p. 90)“Teaching is not to fill empty brains of young students with some fact they should be able to memorize for the next test or something like that”.

From the teachers’ point of view about the teaching and learning process, they noted that:

“Although this method of teaching was time consuming, it was worth trying it out. This method encourages learners to plan, influence and later evaluate their learning. Teachers learn to appreciate learners learning differences. Learners are therefore responsible for their learning and the outcome of their activities since they own the objectives and plan of the activities. Students therefore collaborated with each other to achieve the set goals”.

In the same context, Grabinger et al. (1997, p. 8), noted that through collaboration with classmates, students refine and enhance what they know. When a solution is at hand, they present, justify and debate solutions, looking for the best possible resolution to the problem. From the experiences obtained from the different phases, it was evident that learners experienced quite a number of challenges but still managed to solve them without much influence from the teachers. In comparison with the traditional methods of teaching, the teachers would solve such challenges without involving the learners.



Teachers noted that when students work as a group, they learn to collaborate and to communicate with each other. They also learn to share knowledge and skills especially those who know more can share with those with less knowledge. Students can also learn from others in the group. As a result, they learn to appreciate each other's efforts and contributions towards the completion of a given task. In addition to vocational skills, learners need other skills like communication, collaboration and problem solving skills.

However, According to Kerka (1997, p. 2) the behaviorialist approach of teaching has dominated education, in which the teacher disseminates selected knowledge, measures learners passive reception of facts and focusses on behavior control and task completion. In the project carried out, teachers tried to defy this philosophy and therefore changed the way of teaching and assessment of learners' activities.

According to Tripney et al. (2013, p. 7), the increase of low income, low skilled youth in the labor market, particularly in developing countries is a major concern internationally. With increasing work-and –skills- based solutions to economic competition and poverty in developing world comes a renewed focus on technical and vocational education and training (TVET) as a means to expand opportunities for marginalized youths.

It was therefore necessary to equip learners with the necessary knowledge and skills necessary not only for them to acquire formal employment but also to start up their own income generating activities. Students also evaluated the idea of making briquettes especially from the refuse generated from the kitchen, from the logs and observations made, it was noted that:

Briquette making could “save trees since they use waste materials. It is the best way of disposing of kitchen refuse. It was a very good experience to bake cakes with briquettes. It also takes a shorter time to bake with them and can be used in areas where there is no electricity, they produce no smoke therefore they do not affect the health of the users. They can also be sold to generate income for the people involved”.

In the Ugandan context, the most common type of fuel used in most homesteads is firewood and to some extent charcoal which are both products of wood. Continuous cutting down of trees for the same cause is quite common with very adverse effects. These may include extinction of forests and limited or more supply of fuel because many trees are cut but very few or none is planted. Briquette making will not only save the trees but can also provide employment to the people involved.

In addition, briquetting engenders many micro enterprise opportunities that include production of the press from locally available materials using materials like agricultural waste and sawdust, briquette production enterprise, packaging and selling of the briquette. It also improves health by providing a cleaner burning fuel and also provides a better alternative to firewood (40% more efficient, longer burning and better) as well as helping protect the environment by reducing the number of trees cut for firewood (Emerhi, 2011, p. 237).

This was also in line with the teachers' observations and assessment of the project. Colleagues noted that,

“In addition to improving the teaching and learning process, briquette making business is important to the teachers too. They can use it as an income generating activity for their homes. The idea of recycling kitchen refuse to get briquettes makes the entire process very cheap. With this, I feel we need to do them at home, so that we teach what we practice. If we continue making them at school, we shall not have any disturbances during the lessons especially when the electricity supply is limited”.

From the teachers and learners' analysis and evaluation of the entire project, it therefore follows that actively involving learners in the teaching and learning process, is important, based on the many advantages noted. These may include, students being able to share knowledge and skills, students being able to collaborate with each other during the teaching and learning process and most importantly learning to communicate with each other. As noted by the employer at Ntake bakery, it was necessary to teach students in groups since it's the mode of working encouraged at the work place.

Although participants experienced so many challenges during the project, they still persisted and achieved the major aim of the project. This also helped students to develop thinking and problem solving skills needed in the 21<sup>st</sup> century. Participants also noted that most of the challenges experienced were because of poor planning and since this was an action research project, the cycle continues in order to make the entire system better.

## 5.8 Summary of Chapter Five

This chapter has presented the findings from the field. The data has been presented in phases which included planning, preparation of the raw materials for the briquettes, process of briquette production, cooking with briquettes and evaluation. Each phase has been described in details as it occurred, with specifications of all those who participated. Reflections that participants noted at every phase have been presented.

The findings presented addressed what the researcher transcribed from the observations, interviews conducted during the project. The project entailed recycling kitchen refuse to generate a cheap and alternative source of energy to use for baking. The project majorly focused on improving the teaching and learning process which would later improve the quality of skills acquired by the students of UHTTI, Jinja.

According to Mclean and David (2009) in (Ayonmike et al., 2015, p. 25) TVET is concerned with acquisition of knowledge and skills for world of work to increase opportunities for productive empowerment and socio-economic and rapidly changing environment. TVET thus not only equips people with technical and vocational skills but with a broad range of knowledge, skills and attitudes that are now recognized as indispensable for meaningful participation in work and life. “The major thrust of TVET thus can be described not just as knowledge or facts but includes also practice and comprehensive command of one ‘peculiar ability after training in solving human problems’ (Okoye & Michael, 2015, p. 1).

Reflecting on the above theories, it is evident that vocational education has the capacity to solve society’s needs. Therefore, this project solved part of the society’s need of hygiene and cheap energy provision. The data presented also points out the different roles of the participants in the action research project, which was necessary to ensure that the researcher did research with people not on people. The data also presents learners as active participants in the teaching and learning process, which ensures that their learning is not passive.

The subsequent chapter presents discussion of the findings in line with the problem statement. The main points of discussion include the teaching and learning process done during the project. the researcher has discussed the findings generated about the idea of recycling kitchen refuse to generate a cheap and alternative source of energy to be used for baking cakes. I will also discuss the importance of actively involving learners in the teaching and learning process.

## CHAPTER SIX: DISCUSSION OF FINDINGS

### 6.1 Overview

In this chapter, I present discussion the findings from the action research project that my students (BCPB/Sept class), colleagues and I carried out at UHTTI, Jinja. The students and teachers became active participants in the action research project and provided most of findings discussed. The researcher has discussed the findings from the interviews conducted with reference to the theories discussed in the theory chapter.

Cochran-smith and Lytle, (1992) in (Zeichner, 2001, p. 279) noted that action research alters teachers talk about students from a focus on students problems to an emphasis on student resources and accomplishments and leads to more learner-centered classrooms. These two theories informed my action research project and were part of the basis for my choice of action research project.

Before I start the discussion, I draw your attention to the problem statement that guided the research as:

***How can teachers use learner-centered approaches to improve the teaching and learning process of pastry and bakery?***

In this problem statement, I have considered two areas of great concern for the discussion. These are the teaching and learning process and the Idea of making briquettes as one of the ways to involve learners in the teaching and learning process.

The discussion is also built with reference to the didactical relations model (refer to chapter two). The main point of the model is to contribute to a systematic reflection on teaching and learning and to development and change of such processes. The model also showed the relationship between the different factors that affect the teaching and learning process. In this case once the teaching methods are changed, there was significant change in other factors like objectives and goals in relation to other factors.

## 6.2 The Teaching and Learning process

The teaching and learning process borrowed the constructivist theory of learning which suggests that learners have the ability to create knowledge.

According to Richardson (2005, p. 3), Most constructivists would also agree that the traditional approach to teaching – the transmission model – promotes neither the interaction between prior and new knowledge nor the conversations that are necessary for internalization and deep understanding. The information acquired from traditional teaching, if acquired at all, is usually not well integrated with other knowledge held by the students. Thus, new knowledge is often only brought forth for school-like activities such as exams, and ignored at all other times.

From the above theory, it is clear that the traditional methods of teaching do not promote much learning but they instead promote reading for examinations. During the project, teacher participants noted that learners' attitude as they worked was far much better compared to the old way of teaching. The most important observation was that even those learners who could hardly express or contribute ideas in class, were very active and contributed ideas. This was very amazing to see all learners with very good ideas. It therefore follows that when teachers apply appropriate methods of teaching, learning is facilitated and I believe students achieve more.

During the Action Research project carried out, we emphasized democracy especially during the discussions that were held at the end of every lesson. According to Reason and Bradbury (2001, p. 18) democracy should be emphasized in Action Research and should entail the following:

Dialogue is based on the principle of give and take not one way communication, All concerned by the issue under discussion should have a possibility of participating, Participants are under obligation to help other participants to be active in dialogue, All participants have same status in the dialogue arena and Some of the experience the participant has when entering the dialogue must be seen as relevant and it should be possible for all participants to gain an understanding of the topics under discussion. From the above guidelines, students had equal opportunities to participate in class and were free to contribute their ideas in class without any interference from teachers. The teachers role was only to guide but not dominate the teaching and learning process.

From the data collected, it was observed that learners needed freedom to work on their own, decide what they wanted to learn and go ahead to do it. We also observed that when learners engage in classroom activities as a group, they share knowledge and skills. This is not any different from the constructivist theory of learning, “it suggests that individuals create their own new understandings, based upon the interaction of what they already know and believe, and the phenomena or idea with which they come into contact” (Richardson, 2005).

This follows that the methods of teaching should emphasize high student activity in the teaching and learning process. Students noted that teachers used to dominate the teaching and learning process and therefore rendered them passive recipients of knowledge and skills. They spent quite a larger time in their study time copying notes prepared in advance by the teachers. It would therefore make little sense to attend class since all they did was to listen to the teacher and contribute less in the teaching and learning process. Therefore, there was need to make teaching and learning process more interesting by using learner centered approaches.

According to Michael (2006, p. 160), student centered instruction refers to an instruction approach in which students influence the content, activities, materials and pace of learning. This model places the learner at the center of the learning process. The instructor provides students with opportunities to learn independently and from one another and coach learners in the skills they need to do so effectively.

Before incorporating learner-centered approaches into the teaching and learning process, we had to consider vocational education and its major outcomes and expectations. We also considered the importance of vocational education to the nation and the individual. This was also in consideration of the school mission and vision as earlier noted in chapter two.

The importance of vocational education is echoed across the world as recognized by various writers. The most recognized importance is being able to prepare an individual not only for easy acquisition of formal employment but also creation of employment.

According to Winer, (2000); Oni, (2007) in (Akhuemonkhan & Raimi, 2013, p. 3) TVET is a specialized education designed to empower learners through the development of their technical skills, human abilities, cognitive understanding, attitudes and work habits in order to prepare learners adequately for the world of work or positioned them practically for self-employment after graduation.

In the same context Goel; Afeti in (Ayonmike et al., 2015, p. 25) noted that Skills and knowledge are the engines of economic growth and social development of any Nation and technical and vocational education and training holds the key to training the skilled and entrepreneurial workforce needed for the changing technological workforce.

Form the above theories, it therefore follows that vocational education is recognized as the major education that can transform the country's economy as well as the well-being of an individual. This partly explains why most countries are now embracing vocational education and training. However, Tusiime (2015, p. 107) noted that the formal vocational systems in africa aim for the most part to equip graduates with certificates for progression in the learning system. They become managers and not scientificcally educated, skilled workers who can practically meet the ever changing needs in their local societies. As a result students and teachers work very hard to ensure that students can get good grades on the certificates regardless of the skills and knowledge acquired.

Uganda is not any different from other African countries where certificates awarded after completion of a vocational course are more important than the knowledge and skills acquired during the course. This has therefore affected the the teaching and learning process. To a grater extent teachers and learners spend more time preparing learners for examinations and pay little attention on how the learners learn and how they will behave after school. This equally has affected the vocational institutions especially UHTTI, Jinja and students have also got used to this syndrom. During the planning phase, students still asked whether there was an examination at the end of the project.

This means that students have also got used to the system of certificate regardless of the ability to apply what they have learnt at school. Passing examinations is more important than learning the necessary skills. This has thus led to graduates with very good grades but with very little skills especially ability to work in groups. The issue of training students to acquire certificates was also noted by the person incharge of pastry and bakery department at Ntake bakery. He noted that;

“Most of the students from vocational schools have very good grades but canot deliver nor explain what they learnt at school. Most of the time they concentrate on reading and passing exams instead of acquiring the necessary knowledge and skills”.

According to Kerka (1997, p. 2) “the behaviorialist approach of teaching has dominated education, in which the teacher disseminates selected knowledge, measures learners passive reception of facts and focusses on behavior control and task completion”. Due to the influence of the system I went through, most of my teaching has been inclined on teaching learners on an assumption that they did not have information and therefore I had to give it to them. This was not any different from Zhang (2009, p. 75), who noted that due to the influences of traditional education for quite a long time, vocational-technical schools still follow the traditional educational mode and experiments and practice courses in most schools perform practically no function at all.

After analysing the the teaching and learning process that was currently impemented at UHTTI, Jinja in the departmental meetings held, it was realised that there was need to improve the methods of teaching. Teachers felt there was need to emback on the values of vocational education in uganda and to the individual at large. The was need to produce an all round graduate that could work effectively after school. This therefore meant that ind addition to other interventions, there was need to start from the classroom. This meant that passive learning and evaluating learners based on theoretical work was not necessary any more.

According to Berryman (1991, p. 2) , “passive learning places a premium on reproducing the ‘right answers’ to the teachers or test questions but often without real learning”. Reflecting on the above theories and our own experiences, it therefore follows that to improve vocational education, there is need to work on teaching methods. During the project, project based learning as a method of teaching was utilized. Teachers however noted that when learners are allowed to work as a group, they share information and take learning as their responsibility. There was also collaboration during learning where students worked together to achieve the intended goal of the project.

As noted by Koschmann et al. (1996, p. 90), an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains.



From the data got from the colleagues, the employer and the principal of UHTTI, Jinja, teachers noted the need to change the teaching methods to those that actively involve the learner in the teaching and learning process. “Active methods in teaching and learning have been requested in many educational debates at national and international levels” (Corno, 2000; Stern & Huber, 1997) in (Niemi, 2002, p. 764). This therefore means that the intervention we made to change the methods was a stitch in time. In line with the didactical relations model, it is necessary for the teachers and the students to keep reflecting on the teaching and learning process in order to improve it. In this regard, project based learning and teaching was chosen as the most appropriate method of teaching that particular topic.

According to Buck Institute for Education, (2010); Harris and Katz, (2001); Moursund, (1999) in (Boondee et al., 2011, p. 499), Project based learning (PBL) is a learning method that places students at the center of the learning process. It is widely used to replace the traditional teaching method in which the teacher, who is the center, strictly follows the teaching plan. In PBL classroom, the teacher leads the students to the learning that they desire or learning following the project objectives. The PBL process thus involves an in-depth learning process with systematic learning management to get useful and applicable results, create motivation, and reinforce necessary living skills.

A key point noted during the project executed, participants noted that they felt motivated with the results of the project especially the art of transforming kitchen refuse into briquettes. They also appreciated the fact that learners were active participants in all the activities involved in the project.

Active learning is one of the most important goals in the European scenarios, which include a concept of a learning society. The important characteristic of the learning society is the learners own initiatives and responsibilities for their own progress. Teachers and teacher education are considered as key factors in promoting active learning. All pedagogical arrangements should improve the quality of learning, enhance the quality of opportunities for different learners and help combat social exclusion (Niemi, 2002, p. 763).

In the project carried out, learners were actively involved from the planning throughout the project to the evaluation phase. The most challenging activity during the project was filling logs. Teachers and learners found it hard to fill the logs but after training, the work seemed to be very easy. Through reflections, participants did analysis and evaluation of the entire process and therefore a more appropriate and viable way was always adopted to make the next phase better. It would also provide a way of giving feed back to the members who participated in the project. As earlier noted teachers and learners enjoyed the process and therefore wished that teaching and learning process should always have reflections.

According to Kerdpol (2016, p. 134) noted that to be effective learners, one must; 1) perceive information, 2) reflect on how it will impact some aspect of one's life; 3) compare how it fits our own experiences and 4) think about how this information offers new ways for us to act. Learning requires more than seeing, hearing, moving or touching to learn. We integrate what we see and think with what we feel and how we behave.

With respect to the above reference and with reference to the didactical relations model, participants noted that all factors that affect learning should be interlinked in order to improve the system. We realized that once one factor is changed, it influences change in other factors that make up the teaching and learning process. A key point in this regard was noted when the teaching methods changed, the mode of evaluation, learning environment had to change as well as the way objectives and goals

In the didactical relations model, the fundamental basis of content in this education is the practical professional work rather than traditional theories and disciplines. Considering the learners as the major beneficiaries of the teaching and learning process, their age and their learning needs were at the forefront. As earlier, noted, the students are mature and many experiences which they were willing to share with the students instead of simply being passive listeners. During the project, learners stressed that they need to learn through projects to ensure their active participation. They also noted as a key point of view that they needed to write their own notes instead of relying in what the teachers gave them.

Due to the resources available in the demonstration kitchen and the common practice at the institute, it was therefore necessary to change the learning environment to an environment that did not psychologically show that learning was not taking place. Since the entire project was concerned with improving practice by use of learner-centered approaches, the teachers became facilitators.

Teachers only guided learners during the learning and teaching process and hence provided a learning environment that would encourage the learners to create knowledge, think and solve problems as they occurred. Changing the learning environment was also appreciated by the learners because they actually could not notice that learning was taking place. This was because they had got used to syndrome of learning only when in a classroom.

Another key issue to note during the project was that learners worked as one learning group instead of individuals. This therefore meant that all the learners were directly responsible for results and challenges experienced during the project. This was very necessary because even those who could not speak freely in class had a platform to share their ideas to the group. Those who had more information about the project were very free to share to the group members that was not possible before.

Shakarian, (1995) in Faust and Paulson (1998, p. 12) noted that when students work in groups, they have the opportunity to state their own views, to hear from others, to hone their argumentative skills and so forth, without the administrative requirements of group work. It makes it virtually impossible for students to avoid participating, thus making each person accountable. In addition, Bell (2010, p. 40) noted that “group dynamic creates an interdependent team in which students must each do their part, and as a result, a natural consequence exists for those students who do not demonstrate accountability”.

However, it is important to note that the issue of learning in groups was equally appreciated by the employer at Ntake bakery. He noted that:

“It is actually good to teach them in groups because when they come here in the factory, we group them in different sections and they work together, therefore if schools can train them to work as a group it makes our work very easy”.

His view was in line with Ertmer (2015, pp. 8-9) who agreed that “Collaboration is essential in the world after school. Most learners find themselves in jobs where they need to share information and work productively with others”.

In the same context, the principal of the institute, she also noted that:

“I feel students need more time to work together as a group. This business of spoon feeding students is not good. You need to allow them to think and collaborate with their fellow students and to learn from each other. Some of those students already have experiences from the field where they work. They can help others to learn by sharing their experiences”.

The principals view was not any different from that of colleagues who participated in the project. they noted that teaching and learning in groups could yield better results and therefore improve the quality of our graduates. This is because during the project, students were able to express themselves especially when describing the procedures followed when making briquettes to people outside class.

As a result, learners were able to perfect their communication skills. They were also able to discuss their reflections and observations and solve problems. A number of these skills like communication skills, entrepreneurial skills, collaborative and problem solving skills cannot be achieved if the learners are not given chance to express themselves in class. This therefore means that in addition to vocational skills, learners also need employable skills that are very necessary in the 21st century.

According to Nyerere (2009, p. 4), Skills development encompasses a broad range of skills (entrepreneurial, communication, financial and leadership) so that the individuals are equipped for productive activities and employment opportunities like wage employment, self-employment and income generating activities.

From the data discussed about the teaching and learning process, it therefore follows that teachers need to pay more attention to the methods of teaching utilized during a given subject matter. It is also necessary to consider learners as sources of learning instead of subjects that need to be taught. Students need to be part of all the activities in class especially during planning, teaching and learning process and the evaluation of their achievement in class. teachers need to help learners to evaluate their own work as well as that for their colleagues.

### **6.3 Briquette making**

Briquette making was the project generated by the participants in the action research. The aim of the project was to ensure that learners participate actively in the teaching and learning process to reduce the influence of teachers in class. As noted in earlier chapters, briquette making utilizes materials that are in most cases discarded as refuse. Most of these raw materials are rendered “useless” to the owners. In this project, participants turned the “useless” materials into energy that can be used for cooking and other activities in a home like warming poultry houses.

As noted by Heltberg (2003, p. 10), energy and fuel use are important for the welfare of households in developing countries. To this day, many people remain dependent on traditional biomass fuels for cooking and on inefficient and costly sources of light such as candles and kerosene. Improving access to modern energy sources like electricity and clean cooking technologies is important for the development and improving health and education. Clean cooking fuels are important for combating the high levels of indoor air pollution encountered whenever traditional solid fuels are used for cooking and heating.

The idea of making briquettes from waste material in Uganda is not new because it has been undertaken by Non-Governmental Organizations (NGOs) in various parts of the country. In Namatala slum in Mbale, eastern Uganda, briquettes are made of discarded coffee hulls, rice husks, charcoal particles, sawdust, wood chips and waste paper. The paper acts as a binder for other materials. The group sells some of the briquettes while the rest are used in their homes, UNEMA, (2007) in (Njenga et al., 2009, p. 2).

Briquettes can be made out various raw materials especially from biomass. The practice of making briquettes in Uganda is not very new, most societies have made them for various reasons but most important is using them to cook. The most common source of energy in Uganda has always been firewood and charcoal, which has led to deforestation and extinction of forests in Uganda. Another source of energy in Uganda is electricity whose availability and cost are very unreliable.

To emphasize vocational skills acquisition, it was necessary to train our students in skills of making briquettes since the practice was already going on in the societies outside school. Briquette making has also provided employment to many Ugandans and therefore it became an extra skill to our students so that they can also create their own employment in addition to the formal employment in the bakery industry.

The major aim of VET, is to become an instrument of self-employment to the individual who has been empowered not only by subject matter inhibition but who through experimental learning perceived it as a real life solution to problems and can make use of his initiative in labor market, (Klein-Collin, 2012) in (Okoye & Michael, 2015, p. 1). Given the prevailing economic trend, UNESCO, (2014) in (Dasmani, 2011, p. 70), identified the two major objectives of TVET as the urgent need to train the workforce for self-employment and the necessity to raise the productivity of the informal sector.

In addition, briquetting engenders many micro enterprise opportunities that include production of the press from locally available materials using materials like agricultural waste and sawdust, briquette production enterprise, packaging and selling of the briquette. It also improves health by providing a cleaner burning fuel and also provides a better alternative to firewood (40% more efficient, longer burning and better) as well as helping protect the environment by reducing the number of trees cut for firewood (Emerhi, 2011, p. 237).

Briquette making was one of the best possible projects carried out and as noted by students, they emphasized that briquettes could save the trees, get rid of the refuse in the kitchen, they took a shorter time to bake and noted that they are health friendly. According to Gebrezgabher et al. (2016, p. 2) whom I also agree to, noted that waste processing business models such as dry fuel manufacturing (briquetting), biogas and gasification or energy service company models have the potential to counteract many adverse health and environmental impacts connected with traditional biomass energy. Considering the Ugandan experience where most households depend on firewood to do most of the cooking, such interventions can help save the trees.

In addition to their observations, the employer at Ntake bakery also noted that briquettes were already in use at the bakery therefore it was very necessary to train students in such skills if they were to work in such places. The principal and the colleagues also noted that briquette making was quite a good idea, especially to ensure that practical lessons go on even when there was shortage of electricity and gas. Briquettes have a potential to be a source of renewable energy if they are made from sustainably harvested biomass or waste agricultural residues (Ferguson, 2012, p. 4).

Presently the major source of energy to the rural community is fuel wood because other sources of energy (electricity, gas and kerosene) are either not available or grossly inadequate where available and they are beyond the reach of the masses (Emerhi, 2011, p. 237).

Fire wood usage does not only cause pollution to the users but it also affects the ecosystem and vegetable cover. This is because many people are cutting down trees but very few are planted.

There is need to embrace Wangari Maathai's idea of conserving the environment through planting trees (Maathai, 2011). In addition to her concept of planting trees in Africa, I feel there is need to embrace other sources of energy that utilize very cheap raw materials and at the same time improve sanitation. These include recycling of kitchen refuse to make briquettes.

As noted by Yaman et al, 2000; Olorunnisola (2004) in (Emerhi, 2011, p. 237) briquette making has the potential to meet the additional energy demands of urban and industrial sectors, thereby making a significant contribution to the economic advancement of developing countries. Besides, briquettes have advantages over fuel wood in terms of greater heat intensity, cleanliness, convenience in use and relatively smaller space requirement for storage.

#### **6.4 Summary of Chapter Six**

In this chapter, I have discussed the findings from the field. The major basis for the discussion was the teaching and learning process and the idea of recycling kitchen refuse to generate a cheap alternative energy source. I have also discussed the importance and expectations from vocational education. I have discussed the need to encourage students to work in groups and to share knowledge.

According to Atechoarena and Delluc (2002, p. 13) the emerging focus on learners motivation and incentives seems to lack relevance in educational environments where the main issues remain the ones of access and provision. Poor and in some countries decreasing quality of training present major challenges. More support and attention is required at institutional level to change public providers' attitudes while improving quality provision.

Although there has been an effort to introduce energy saving stoves, they still utilize charcoal which further degrades the environment. I believe to use the energy saving stoves, its necessary to use briquette to power them.

## **CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS**

### **7.1 Conclusion**

The action research project carried out at UHTTI, Jinja, considered views from students, colleagues, administrator and employer at Ntake bakery. Ntake bakery is one of the major employers for the students from UHTTI, Jinja. The major purpose of the project was “How can teachers use learner-centered approaches to improve the teaching and learning process of pastry and bakery? To ensure active learning, students of BCPB 2016(Sept intake), colleagues in pastry and bakery department, generated a project where kitchen refuse was recycled to generate energy that could bake cakes. This project was one of the ways to change from traditional teaching method to more learner-centered approaches.

As a teacher trainee at Kyambogo University for three years, I experienced teacher centred approaches of teaching which affected my output in my work place as a teacher. B. L. Brown (2003, p. 3) observed that since a great many teachers have experienced academic success in learning environments that were instructor centred and relied heavily on lecture, it is understandable that their preferred style of teaching, at least initially, would be to repeat what worked with them. The learner had very small input during the learning and teaching process.

This therefore formed a basis for improvement in the teaching and learning process at UHTTI, Jinja with the students and the colleagues. This intended to improve the quality of graduates and it was also necessary to consider learners learning needs, abilities and prior knowledge. It was also necessary to encourage students to share knowledge, skills and also learn to solve problems as they occurred. As noted by Koschmann et al. (1996, p. 90) an effective instructional method should promote activeness in learning, through self-direction, goal setting, problem finding, problem solving and self-testing. It should also engage the learner in problem solving that requires the aggressive inquiry, reasoning and reflecting demanded of ill-structured problems and knowledge domains.

With reference to the above theory, it is evident that all methods of teaching especially in vocational education should encourage active participation of the learners that is the main intention of the constructivists.



According to Richardson (2005, p. 3), Most constructivists would also agree that the traditional approach to teaching – the transmission model – promotes neither the interaction between prior and new knowledge nor the conversations that are necessary for internalization and deep understanding. The information acquired from traditional teaching, if acquired at all, is usually not well integrated with other knowledge held by the students. Thus, new knowledge is often only brought forth for school-like activities such as exams, and ignored at all other times.

Constructivism views learning as an active process in which learners strive for understanding and competence on basis of their personal experience. Learning is constructivist because previous knowledge is revised, reorganized and even reinterpreted in order to reconcile it with new input (Mjelde & Daly, 2006, p. 89). With this, I believe that the traditional way of teaching might not be applicable in vocational education training that requires students to be more innovative and in order to solve problems. This therefore means that learner centered approaches like project based learning are more efficient. This was also realized during the project where students felt highly motivated to try out their own knowledge instead of taking in teachers' content wholesomely.

According to (Michael, 2006, p. 160). “Learner centered approaches encourage active learning by the students which in return can lead to increased motivation to learn, greater retention of knowledge, deeper understanding and more positive attitudes towards the subject being taught”. In the same context, Knowles (1983) in Macaulay et al. (2000, p. 6) in learner centered concept of learning , knowledge is not given but actively acquired and interpreted by the individual. In this concept transfer of learning is facilitated by creating a suitable climate for learning, acknowledging that feelings and attitudes of the learner as important as their cognitive strategies in dealing with the learning task, enhancing their capacity for self-direction and allowing time for reflection and making connections between prior and present experiences.

In consideration of the environment, it is necessary to generate environmental friendly sources of energy like briquettes especially those made from kitchen refuse. This doesnot only help to dispose of refuse but it saves the extinction of the forests. This is because the cheapest and most utilised source of feul in uganda is wood. Everyday several trees are cut down yet none is planted. According to Gebrezgabher et al. (2016, p. 2) whom I also agree to, waste processing business models such as dry fuel manufacturing (briquetting), biogas and gasification or energy service company models have the potential to counteract many adverse health and environmental impacts connected with traditional biomass energy.

Lastly it is good to note that with reference to Tynjälä (2008) in Gijbels et al. (2010, p. 1), in today's rapidly evolving society, we are confronted with an exponential increase in information, growing need for innovation and the requirement to develop sufficient skills. Schools, enterprises and players in the field of training are faced with the challenge of finding, valuing and further developing every talent. The high level of competence and innovative capacity on which the economy is based are strongly determined by the development and training which employees have undergone.

## **7.2 Recommendations**

From the data documented in the data presentation chapter, I believe this research project has many benefits not only to the researcher but to also to the participants and the Ugandan education system. This was in line with Bruner (1990) in (Aakre, 2009, p. 90), who noted that "learning is also a social process including communication and interaction with others". It is therefore not good to teach students in a way that does not allow them to interact with others. This is because after school, they come to meet and work with other people especially at their future work place.

Throughout the project, I realized it was very necessary to plan all activities with the participant before the project starts. Participants also need to be aware of all the procedures, objectives, risks and the benefits of the project before they enrolled into the research project. They also needed to set their own rules and regulations to follow during the project.

Using learner centered approaches during the teaching and learning process enhances learners' abilities to share information, learn to communicate with each other and learn to work with each other, which are part of the 21<sup>st</sup> century skills needed. It is therefore necessary to involve learners in the teaching and learning process. This is because "Learner centered approaches encourage active learning by the students which in return can lead to increased motivation to learn, greater retention of knowledge, deeper understanding and more positive attitudes towards the subject being taught" (Michael, 2006, p. 160). In the same context, UNESCO (1987) in (Ddungu-Kafuluma, 2014, p. 1) noted that "teachers can only manage learning effectively if they give importance not only to what is taught, but the way in which it should be prepared and taught".

Briquette making is quite an important way of disposing of kitchen refuse. It does not only improve the hygiene of the kitchen but also helps to reduce the pressure on the Ugandan forests. This is because most of the fuel used in Uganda is wood and therefore recycling kitchen refuse to generate energy will help to preserve the ecosystem. As noted by Yaman et al, 2000; Olorunnisola (2004) in (Emerhi, 2011, p. 237) briquette making has the potential to meet the additional energy demands of urban and industrial sectors, thereby making a significant contribution to the economic advancement of developing countries. Besides, briquettes have advantages over fuel wood in terms of greater heat intensity, cleanliness, convenience in use and relatively smaller space requirement for storage.

After analyzing the importance of making briquettes especially to the environment I believe there is need to embrace Wangari Maathai's idea of conserving the environment through planting trees (Maathai, 2011). In addition to her concept of planting trees in Africa, I feel there is need to embrace other sources of energy that utilize very cheap raw materials and at the same time improve sanitation. These include recycling of kitchen refuse to make briquettes.

From an ecological point of view, I believe it's necessary to engage in briquette making business not only to create energy but to also reduce the rate of environmental degradation. Recycling kitchen refuse does not only ensure a clean environment but it also but it save the environment the bad smell caused by the decaying kitchen refuse. Although there have been efforts to create energy saving cook stove I believe it is not enough if they still use charcoal to cook. Charcoal is obtained solely from wood and this means trees are cut down to make charcoal. The idea to save the environment is not one man's effort, but for all individuals concerned especially those who have the power and authority to effect change.

## REFERENCES

- Aakre, B. M. (2009). Philosophy of education in Norway.
- Aguti, S. (2015). *School Inspection and its Influence in the Quality Development of Inclusive Education Practice in Uganda*. (Master of Philosophy in Special Needs Education), University of Oslo, Norway.
- Akhuemonkhan, I., & Raimi, L. (2013). *Impact of Quality Assurance on Technical Vocational Education and Training (TVET) In Nigeria*. Paper presented at the Presentation at the 2013 IVETA Annual Conference on Quality Assurance in Technical-Vocational Education and Training (TVET), Las Vegas, Nevada, United State on December.
- Atechoarena, D., & Delluc, A. (2002). *Revisting Technical and Vocational Education in Sub-Saharan Africa: An update on Trends, Innovation and Challenges*: International Institute for Educational Planning/ UNESCO.
- Ayeni, A. O. (2015). World Wide Comparism of Technical and Vocational Education: Lessons for Nigerian Technical and Vocational Education Sector (I). *Journal of Education and Practice*, 6(30), 103-110.
- Ayonmike, C. S., Okwelle, P. C., & Okeke, B. C. (2015). Towards Quality Technical Vocational Education and Training (Tvet) Programmes in Nigeria: Challenges and Improvement Strategies. *Journal of Education and Learning*, 4(1), 25-34.
- Baker, J. H. (2003). Teaching tip: The learning log. *Journal of Information Systems Education*, 14(1), 11.
- Barbour, R. S., & Barbour, M. (2003). Evaluating and synthesizing qualitative research: the need to develop a distinctive approach. *Journal of Evaluation in Clinical Practice*, 9(2), 179-186. doi:10.1046/j.1365-2753.2003.00371.x
- Barr, R. B., & Tagg, J. (1995). From Teaching to Learning — A New Paradigm For Undergraduate Education. *Change: The Magazine of Higher Learning*, 27(6), 12-26. doi:10.1080/00091383.1995.10544672
- Bell, S. (2010). Project-Based Learning for the 21st Century: Skills for the Future. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 83(2), 39-43. doi:10.1080/00098650903505415
- Berg, B. L., & Lune, H. (2012). *Qualitative Research Methods for Social Sciences* (8th ed.). USA: Pearson.
- Berryman, S. (1991). Designing Effective Learning Environments: Cognitive Apprenticeship Models. *IEE Brief*.
- Billett, S. (2014). The standing of vocational education: sources of its societal esteem and implications for its enactment. *Journal of Vocational Education & Training*, 66(1), 1-21. doi:10.1080/13636820.2013.867525
- Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning. *Educational Psychologist*, 26(3-4), 369-398. doi:10.1080/00461520.1991.9653139
- Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom*. 1991 ASHE-ERIC Higher Education Reports: ERIC.
- Boondee, V., Kidrakarn, P., & Sa-Ngiamvibool, W. (2011). A learning and teaching model using project-based learning (PBL) on the web to promote cooperative learning. *European Journal of Social Sciences*, 21(3), 498-506.
- Bradbury, H., & Reason, P. (2003). Action research an opportunity for revitalizing research purpose and practices. *Qualitative social work*, 2(2), 155-175.
- Brockmann, M. (2007). *Qualifications, Learning Outcomes and Competencies: A Review of European Divergences in Vocational Education and Training (VET): A Review of Literature*: London, England: Nuffield Foundation.
- Brown, B. L. (2003). Teaching Style vs. Learning Style. Myths and Realities.

- Brown, G., Bull, J., & Pendlebury, M. (2013). *Assessing student learning in higher education*: Routledge.
- Bryman, A. (2012). *Social Research Methods* (4th ed.). New York: Oxford University Press Inc.
- Calder, J. A., & McCollum, A. (1998). *Open and flexible learning in vocational education and training*: Psychology Press.
- Clarke, L., & Winch, C. (2007). *Vocational education : international approaches, developments and systems*. London: Routledge.
- Cohen, E. G., & Lotan, R. A. (2014). *Designing Groupwork: Strategies for the Heterogeneous Classroom Third Edition*: Teachers College Press.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th ed.). New York: Routledge.
- Colley, H., James, D., Diment, K., & Tedder, M. (2003). Learning as becoming in vocational education and training: class, gender and the role of vocational habitus. *Journal of Vocational Education & Training*, 55(4), 471-498. doi:10.1080/13636820300200240
- Dasmani, A. (2011). Challenges facing technical institute graduates in practical skills acquisition in the Upper East Region of Ghana. *Asia-Pacific Journal of Cooperative Education*, 12(2), 67-77.
- Ddungu-Kafuluma, M. J. (2014). A Review of the Quality of Technical Teacher Training in Uganda: Implication for Global Competitiveness. *African Journal of Education, Science and Technology*, 1(4), 27.
- de Bruijn, E., & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: Challenges to vocational educators. *Teaching and Teacher Education*, 27(4), 694-702. doi:<http://dx.doi.org/10.1016/j.tate.2010.11.007>
- Demirbas, A. (2009). Sustainable Charcoal Production and Charcoal Briquetting. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 31(19), 1694-1699. doi:10.1080/15567030802094060
- Downes, S. (2010). New technology supporting informal learning. *Journal of Emerging Technologies in Web Intelligence*, 2(1), 27-33.
- Emerhi, E. (2011). Physical and combustion properties of briquettes produced from sawdust of three hardwood species and different organic binders. *Advances in Applied Science Research*, 2(6), 236-246.
- Ertmer, P. A. (2015). *Essential Readings in Problem-based Learning*: Purdue University Press.
- Faust, J. L., & Paulson, D. R. (1998). Active learning in the college classroom. *Journal on Excellence in College Teaching*, 9(2), 3-24.
- Ferguson, H. (2012). Briquette Businesses in Uganda. *The Potential for Briquette Enterprises to Address*.
- Gebrezgabher, S., Amewu, S., Taron, A., & Otoo, M. (2016). *Energy recovery from domestic and agro-waste streams in Uganda: a socioeconomic assessment*. Retrieved from
- Gijbels, D., Raemdonck, I., & Vervecken, D. (2010). Influencing Work-Related Learning: The Role of Job Characteristics and Self-Directed Learning Orientation in Part-Time Vocational Education. *Vocations and Learning*, 3(3), 239-255. doi:10.1007/s12186-010-9041-6
- Grabinger, S., & Dunlap, J. (1995). Rich environments for active learning: A definition. *Research in learning Technology*, 3(2).
- Grabinger, S., Dunlap, J. C., & Duffield, J. A. (1997). Rich environments for active learning in action: problem-based learning. *Research in learning Technology*, 5(2).
- Harper, A. (2016). *TEACHER GUIDE: Using Project-Based Learning to Develop Students' Key Competences*. Retrieved from [http://keyconet.eun.org/c/document\\_library/get\\_file?uuid=d2e33016-9c19-4901-aa00-5d25c5d734f2&groupId=11028](http://keyconet.eun.org/c/document_library/get_file?uuid=d2e33016-9c19-4901-aa00-5d25c5d734f2&groupId=11028):
- Heltberg, R. (2003). Household fuel and energy use in developing countries: A multi-country study. *Oil and Gas Policy Division, World Bank. Washington, DC: The World Bank*.
- Hiim, H. (2007). A strategy for practice-based education and research. *The quality of practitioner research: reflections on the position of the researcher and the researched*, 97-114.

- Hiim, H. (2011). Epistemological Perspectives in an Approach to Teacher Research. *Researcher in teacher education*, 1 (1), 19-30.
- Hillier, Y. (2009). Innovation in Teaching and Learning in Vocational Education and Training: International Perspectives. Research Overview. *National Centre for Vocational Education Research (NCVER)*.
- Jakubowski, L. M. (2003). Beyond book learning: Cultivating the pedagogy of experience through field trips. *Journal of Experiential Education*, 26(1), 24-33.
- Jossberger, H., Brand-Gruwel, S., Boshuizen, H., & van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: a theoretical analysis and synthesis of requirements. *Journal of Vocational Education & Training*, 62(4), 415-440. doi:10.1080/13636820.2010.523479
- Kawulich, B. B. (2005). Participant Observation as a Data Collection Method(81 paragraphs). *Forum: Qualitative Social Research*, 6(2(Art 43)).
- Kerdpol, S. (2016). An Application of Project-Based Learning on the Development of Young Local Tour Guides on Tai Phuan's Culture and Tourist Attractions in Sisatchanalai District, Sukhothai Province. *English Language Teaching*, 9(1), 133-141.
- Kerka, S. (1997). Constructivism, Workplace Learning, and Vocational Education. ERIC Digest No. 181.
- Kerka, S. (2002). Teaching Adults: Is It Different? Myths and Realities.
- Khanlou, N., & Peter, E. (2005). Participatory action research: considerations for ethical review. *Social Science & Medicine*, 60(10), 2333-2340. doi:<http://dx.doi.org/10.1016/j.socscimed.2004.10.004>
- Koschmann, T., Kelson, A. C., Feltovich, P. J., & Barrows, H. S. (1996). Computer-supported problem-based learning: A principled approach to the use of computers in collaborative learning. *CSCL: Theory and practice of an emerging paradigm*, 83-124.
- Kyarizi, L. (2012). Improving my practice as a facilitator of learning while using learner-centred approaches to teaching and learning: an action research project carried at the section of Technological studies, Department of Civil and Building Engineering, Kyambogo University, Uganda.
- Lucas, B., Spencer, E., & Claxton, G. (2012). How to teach vocational education: A theory of vocational pedagogy. City and guilds centre for skill development: London: UK.
- Maathai, W. (2011). Challenge for Africa. *Sustainability Science*, 6(1), 1-2.
- Macaulay, C., Cree, V., & Macaulay, C. (2000). Transfer of learning. *Transfer of Learning in Professional and Vocational Education: Handbook for Social Work Trainers*, 1-26.
- McIntosh, M. E., & Draper, R. J. (2001). Using learning logs in mathematics: Writing to learn. *The Mathematics Teacher*, 94(7), 554-557.
- McNiff, J. (2016). *You and your action research project*: Routledge.
- McNiff, J., & Whitehead, J. (2009). *Doing and Writing Action Research*. London: Sage Publications LTD.
- Merriam, S. (1995). What Can You Tell From An N of 1?: Issues of validity and reliability in qualitative research. *PAACE Journal of Lifelong Learning*, 4, 50-60.
- Michael, J. (2006). Where's the evidence that active learning works? *Advances in physiology education*, 30(4), 159-167.
- Mjelde, L., & Daly, R. (2006). *Working knowledge in a globalizing world: from work to learning, from learning to work* (Vol. 3): Peter Lang.
- MoES. (2001). *The Development of Education in Uganda in the Last Ten Years*. Retrieved from [www.ibe.unesco.org/International/ICE/natrap/Uganda](http://www.ibe.unesco.org/International/ICE/natrap/Uganda):
- MoES. (2011). *Skilling Uganda, BTVET Strategic Plan 2011-2020*. Kampala.
- Mwampamba, T. H., Owen, M., & Pigaht, M. (2013). Opportunities, challenges and way forward for the charcoal briquette industry in Sub-Saharan Africa. *Energy for Sustainable Development*, 17(2), 158-170. doi:<http://dx.doi.org/10.1016/j.esd.2012.10.006>

- Nganda, A. T. (2010). *Developing my Practical Ability in Facilitating Learning while Working with Instructors of NPAYVTC in Learning Groups*. (Masters in Vocational Pedagogy), Akershus University College.
- Ngusale, G. K., Luo, Y., & Kiplagat, J. K. (2014). Briquette making in Kenya: Nairobi and peri-urban areas. *Renewable and Sustainable Energy Reviews*, 40, 749-759.  
doi:<http://dx.doi.org/10.1016/j.rser.2014.07.206>
- Niemi, H. (2002). Active learning—a cultural change needed in teacher education and schools. *Teaching and Teacher Education*, 18(7), 763-780. doi:[http://dx.doi.org/10.1016/S0742-051X\(02\)00042-2](http://dx.doi.org/10.1016/S0742-051X(02)00042-2)
- Njenga, M., Karanja, N., Prain, G., Malii, J., Munyao, P., Gathuru, K., & Mwasi, B. (2009). Community-based energy Briquette production from urban organic waste at Kahawa Soweto Informal Settlement, Nairobi. *ISSN 1811-1440, Urban Harvest*.
- Nolen, A. L., & Vander Putten, J. (2007). Action research in education: Addressing gaps in ethical principles and practices. *Educational Researcher*, 36(7), 401-407.
- Nyerere, J. (2009). Technical and Vocational Education and Training (TVET) sector mapping in Kenya. *Report Draft: Edukans Foundation*.
- Ochan, M. L. (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*. (masters), Oslo and Akershus University College of Applied Sciences, Norway.
- Okou, J. E. (2002). *Meeting the challenges of Technical/Vocational Education: The Ugandan Experience*. Paper presented at the Workforce Education Forum.
- Okoye, K. R. E., & Michael, O. I. (2015). Enhancing Technical and Vocational Education and Training (TVET) in Nigeria for Sustainable Development: Competency-Based Training (CBT) Approach. *Journal of Education and Practice*, 6(29), 66-69.
- Ospina, S., Dodge, J., Godsoe, B., Minieri, J., Reza, S., & Schall, E. (2004). From consent to mutual inquiry Balancing democracy and authority in action research. *Action Research*, 2(1), 47-69.
- Placklé, I., Könings, K. D., Jacquet, W., Struyven, K., Libotton, A., van Merriënboer, J. J., & Engels, N. (2014). Students' Preferred Characteristics of Learning Environments in Vocational Secondary Education. *Online Submission*, 1(2), 107-124.
- Poortman, C. L., Illeris, K., & Nieuwenhuis, L. (2011). Apprenticeship: from learning theory to practice. *Journal of Vocational Education & Training*, 63(3), 267-287.  
doi:10.1080/13636820.2011.560392
- Reason, P., & Bradbury, H. (2001). *Handbook of action research: Participative inquiry and practice*: Sage.
- Richardson, V. (2005). *Constructivist teacher education: Building a world of new understandings*: Routledge.
- Scanlon, D. (1964). *Education in Uganda*: US Department of Health, Education, and Welfare.
- Schank, R. C., Berman, T. R., & Macpherson, K. A. (1999). Learning by doing. *Instructional-design theories and models: A new paradigm of instructional theory*, 2, 161-181.
- Soparat, S., Arnold, S. R., & Klaysom, S. (2015). Development of Thai Learners key Competencies by Project-Based Learning using ICT *International Journal of Research in Education and Science(IJRES)*, 1(1), 11-22.
- Tripney, J., Hombrados, J., Newman, M., Hovish, K., Brown, C., Steinka-Fry, K., . . . Campbell, C. (2013). *Technical and Vocational Education and Training (TVET) Interventions to Improve the Employability and Employment of Young People in Low- and Middle-Income Countries: A Systematic Review*. *Campbell Systematic Reviews 2013:9*. Retrieved from <https://login.ezproxy.hioa.no/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED558002&site=ehost-live>
- Tusiime, W. E. (2015). CHAPTER SIX INDIGENOUS KNOWLEDGE FOR SUSTAINABLE VOCATIONAL EDUCATION WYCLIFF EDWIN TUSIIME. *Myths and Brands in Vocational Education*, 100.

- Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review*, 3(2), 130-154. doi:<http://dx.doi.org/10.1016/j.edurev.2007.12.001>
- UNESCO-UNEVOC. (2014). *World TVET Database Country profiles Uganda*. Germany: UN Campus Platz der Vereinten Natronen 1.
- Veeresh, S. J., & Narayana, J. (2013). Sustainable Utilization of Agro-waste for High Calorific Energy Briquettes. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, 35(14), 1375-1384. doi:10.1080/15567036.2010.525594
- Zeichner, K. (2001). Educational action research. *Handbook of action research: Participative inquiry and practice*, 273-283.
- Zhang, W. (2009). Issues of Practical Teaching in Vocational-Technical Schools in China and Their Countermeasures. *International Education Studies*, 2(4), 75.



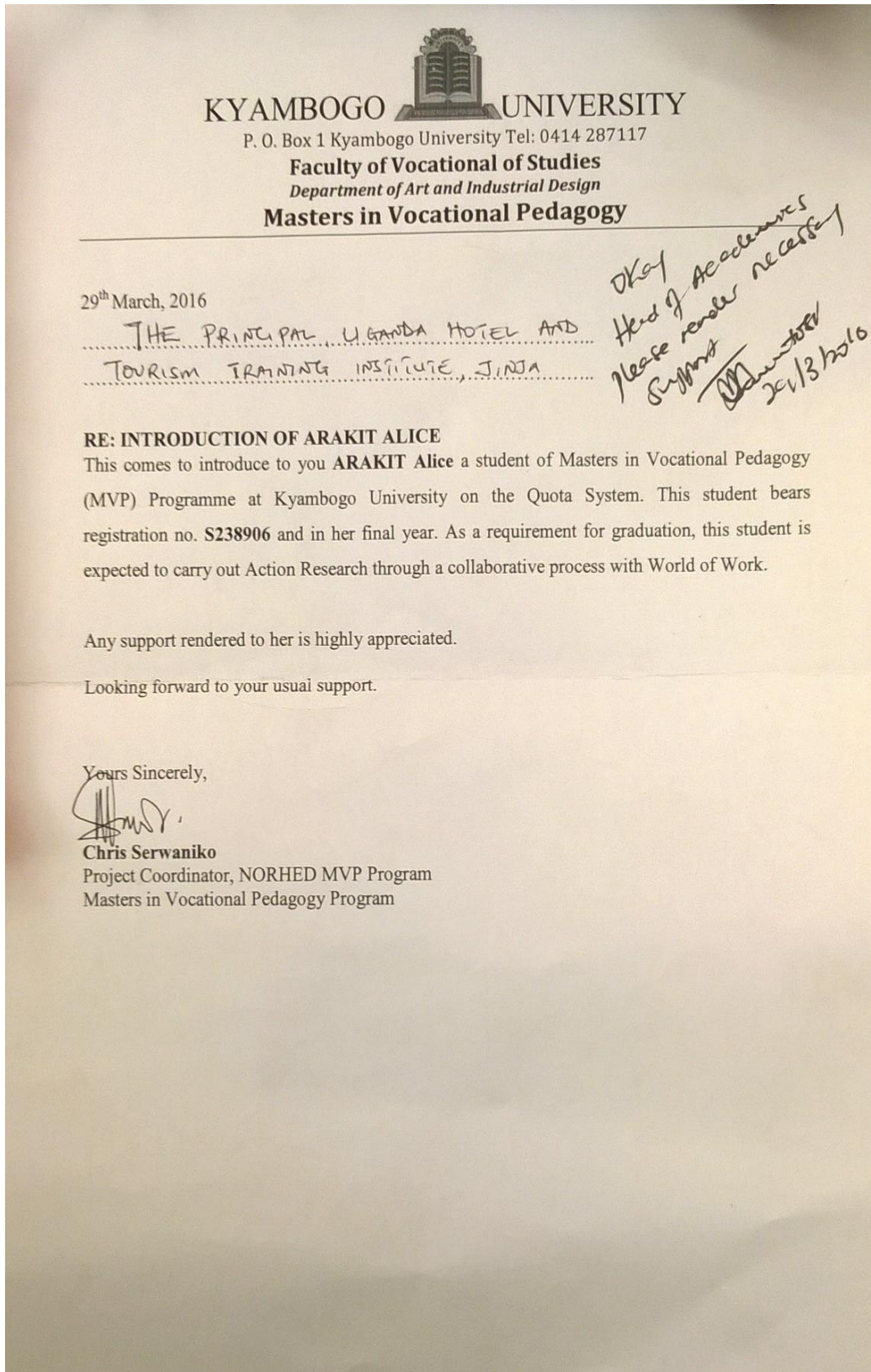
## **APPENDIX A**

### Interview guide

1. What do you think about the current way of teaching in vocational institutes?
2. Do you think there is a way it can be changed?
3. How important is involving learners actively in the teaching and learning process?
4. How necessary is teaching learners as a group especially after school/graduation?
5. Do you think briquettes are necessary in the pastry and bakery development?
6. How effective do think are briquettes in the pastry and bakery industry?

**APPENDIX B**

Copy of Letter of consent



**KYAMBOGO UNIVERSITY**

P. O. Box 1 Kyambogo University Tel: 0414 287117

**Faculty of Vocational of Studies**  
*Department of Art and Industrial Design*  
**Masters in Vocational Pedagogy**

29<sup>th</sup> March, 2016

THE PRINCIPAL UGANDA HOTEL AND  
TOURISM TRAINING INSTITUTE, JINJA

*OKAY  
Head of Academics  
Please render necessary  
support  
[Signature]  
21/3/2016*

**RE: INTRODUCTION OF ARAKIT ALICE**

This comes to introduce to you **ARAKIT Alice** a student of Masters in Vocational Pedagogy (MVP) Programme at Kyambogo University on the Quota System. This student bears registration no. **S238906** and in her final year. As a requirement for graduation, this student is expected to carry out Action Research through a collaborative process with World of Work.

Any support rendered to her is highly appreciated.

Looking forward to your usual support.

Yours Sincerely,

**Chris Serwaniko**  
Project Coordinator, NORHED MVP Program  
Masters in Vocational Pedagogy Program

## APPENDIX C

### Consent to participate in the research project

My name is Alice Arakit a student at Oslo and Akershus University college of Applied Sciences pursuing a master's degree in Vocational Pedagogy. As a requirement for the degree, I have undertaken an action research project titled improving teaching and learning process of pastry and bakery using learner centered approaches. This is therefore to request you to participate in the action research project that will involve making briquettes. Please confirm your participation by signing the letter below.

I \_\_\_\_\_ agree that by signing this letter confirm that I will participate in the action research project to make briquettes out of kitchen refuse.

I affirm that the decision to participate in the project was not influenced by the researcher but it was my own decision. I also affirm the following:

My participation in the project is not fixed therefore I can withdraw any time without first notifying the researcher.

The researcher has also clearly explained the risks, benefits and activities involved in the project and I have accepted to participate in all of them.

The researcher has clearly explained the major importance of the research information obtained which has no bearing and I agree that it will not have any bad effect to my stay in school.

I have also agreed that my identity and confidentiality will be kept especially my names and age

I also affirm that after signing the consent letter, I will retain a copy for future reference.

I also confirm that my photograph can be used in the final document.

Signature \_\_\_\_\_ Date \_\_\_\_\_