

**IMPROVING PROJECT BASED LEARNING TO ENHANCE TRAINEES' SKILLS
ACQUISITION IN WELDING AND METAL FABRICATION AT BUHIMBA
TECHNICAL INSTITUTE IN HOIMA, UGANDA**

BY

ELARU PATRICK

REG. NO. 16/U/14008/GMVP/PE

**A THESIS SUBMITTED TO KYAMBOGO UNIVERSITY GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A
DEGREE OF MASTER OF VOCATIONAL PEDAGOGY OF KYAMBOGO
UNIVERSITY**

NOVEMBER 2019

DECLARATION

I, **Elaru Patrick**, do hereby declare that this Action Research thesis is entirely my own original work and has never been submitted to any other University or Institution of higher learning for the award of a degree, diploma or any other academic qualifications.

Signature: -----

Name: **ELARU PATRICK**

Date: -----

APPROVAL

This is to acknowledge that this Action Research Thesis was submitted with the approval of the under signed Supervisors.

1. Dr Catherine Wandera (DSc)

Sign:

Date:

2. Dr. Jacob L. Oyugi (PhD)

Sign:

Date:

DEDICATION

This research work is dedicated to my Aunt Perpetua Ayago for the care and prayer up to where I am to date, my loving wife Abeja Scholastica, my dear sons, Kevin and Daniel and my late mother Auma Sekundina for her spirited fight in ensuring that am brought to life on this planet

ACKNOWLEDGEMENT

I am grateful to my supervisors Dr Catherine Wandera and Dr Jacob Lalango Oyugi for their contribution and guidance throughout the course of the action research project and above all the willingness and desire to drill me through the acts of writing is highly appreciated. Acknowledged in this research work are Dr Nabagala Justine, Chris Serwaniko and Mr. Kyakulumbye Ali for their wonderful suggestions and mentorship during the process to ensure that the defence of my action research thesis is successful. I highly appreciate all the lecturers and mentors in the Faculty of Vocational Studies for their various contributions in diverse ways towards the successful completion of this research study. With due regard, I recognise Engineer Aduttu Jorem, Principal National Instructors' College Abilonino (NICA), for the support in the program and willingly accepted to release me to attend the MVP program. I acknowledge with gratitude the sponsorship and support of the NORHED project at Kyambogo University for offering me the wonderful opportunity to expand my career in the field of vocational pedagogy. I recognize the participation of stakeholders (trainees, staff and Administration of BTI) who spared their valuable time for the success of this action research study. Additionally, I acknowledge all my MVP cohort six colleagues most especially Kwizira Henry, friends especially Assaaja Abrahams John, and my family members for their words of encouragement, support and prayers. Finally, I thank the Almighty God for enabling me go through the process of the action research study.

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ACRONYMS

AR	Action Research
ATL	Active Teaching and Learning
BTI:	Buhimba Technical Institute
BTVET:	Business Technical Vocational Education and Training
FGDs	Focus Group Discussions
FW	Future Workshop
HOD	Head of Department
HSE	Health, Safety and Environment
MoE:	Ministry of Education and Sports.
MoES	Ministry of Education and Sports
MVP	Masters in Vocational Pedagogy
NICA	National Instructors' College Abilonino
NORHED	Norwegian Council for Higher Education
PAR:	Participatory Action Research
PBL:	Project Based Learning / Problem Based Learning
PPE	Personal Protective Equipment
TVET:	Technical Vocational Education and Training
WoW:	World of Work

DEFINITIONS OF OPERATIONAL KEY TERMS AND CONCEPTS

Skills Acquisition: Is ability to do or perform an activity that is related to some meaningful exercise, work or job.

Formal Programme: Is the programme which is structured, has a specific curriculum and lasts for a long period of time like two years

Non-Formal Programme: Is the programme which is not structured, doesn't have a specific curriculum but is only delivered as a few practical modules that last for a short period of time like three months.

Module: Is a series of tasks organized to impart specific theoretical and practical skills.

Instructing: Is to furnish with knowledge, especially by a systematic method. Instruction is the imparting of knowledge, developing of skills and attitudes, and meeting of special needs in various ways ranging from structured to individualized activities, including instructional support activities which aid and enrich the teaching-learning process.

Instructional Strategies: Instructional strategies are the various methods and activities used to help the training participants acquire the learning objectives. This is how the trainer transfer his/ her knowledge and skills to the training participants.

Proficiency: Mastery of a specific behavior or skill demonstrated by consistently superior performance, measured against established or popular standards

Project Based Learning: An active learning method which aims to engage students in acquiring knowledge and skills through real world experiences and well planned activities

Complexities: In general, a complexity or complexities can be defined as the state or quality of being intricate or complicated.

ABSTRACT

This action research was conducted in the Welding and Metal Fabrications department at Buhimba Technical Institute in Hoima District. The problem of inadequate trainees' skills acquisition was identified and subsequently, this study aimed at improving the delivery of Project Based Learning for enhancement of trainees' skills acquisition. The study was guided by three research objectives; to explore the possible strategies that could be employed to improve PBL for skills acquisition, to implement the possible strategies to improve PBL for skills acquisition and to evaluate the impact of the implemented strategies on PBL for skills acquisition in welding and metal fabrications at BTI. There is noticeable laxity in engagement of active teaching and learning processes as it has contributed to instructors' preference of teacher centered approaches rather than learner centered ones. A qualitative approach and a Participatory Action Research design was employed in the study where stakeholders collectively participated in a situation analysis and Futures Workshop. Participants were purposively selected and the study employed Interviews, Focus Group Discussions, Future Workshops and Participant Observations as methods of data collection. The data collected was translated, coded and presented under the themes following the objectives of the study. The mode of delivery for PBL was improved through the following: observance of HSE and use of PPE, engaging trainees through Real Life Projects and employing Assessment Training Package Tool. Trainees' skills acquisition was seen to be hindered by unavailability of training materials and limited exposure to world of work.

CHAPTER ONE: INTRODUCTION

1.1 Overview

The chapter presents the background to the study, statement of motivation, situation analysis / work process analysis, future workshop, statement of the problem, the purpose of the study, objectives of the study, research questions, justification of the study, significance of the study and scope of the study.

1.2 Background to the Study

The study was based on improvement of Problem Based Learning (PBL) for enhanced trainees' technical skills acquisition, therefore, background to the study is constituted of a personal background and experience in technical training, and a background to Project Based Learning.

1.2.1 Background of Project Based Learning in Technical Institution

Project Based Learning (PBL) is an active student-centred form of instruction which is characterized by students' autonomy, constructive investigations, goal-setting, collaboration, communication and reflection within real-world practices (Kokotsaki, 2016). Project-based learning is based on three constructivist principles, namely: (1) Learning is context-specific, (2) Learners are involved actively in the learning process, and (3) Learners achieve their goals through social interactions and sharing of knowledge and understanding (Cocco, 2006). Problem Based Learning is considered to be a particular type of inquiry-based learning where the context of learning is provided through authentic questions and problems within real-world practices (Al-Balushi & Al-Aamri, 2014) that lead to meaningful learning experiences (Wurdinger, Haar, Hugg & Bezon, 2007) cited in (Kokotsaki, 2016).

1.2.2 Personal background and experience

I am a trained instructor for welding and metal fabrications; my field of training was in the area of Agricultural Mechanization and Ginning Engineering of Busitema National Agricultural College of Mechanization at diploma level and also a graduate of Vocational Studies in Technological Studies with Education of Kyambogo University (KYU). I am currently working as a technical instructor and also holding the leadership position of Deputy Principal at Buhimba Technical Institute (BTI), a Government aided Technical Institute located in Buhimba sub-county in Hoima district along the Hoima - Fort portal road.

Furthermore, I am currently pursuing a Masters degree in Vocational Pedagogy under fellowship scholarship of NORHED project at Kyambogo University. The vocational pedagogy study programme has placed me in a better position to undertake Action Research in the areas of technical training which requires a collaborative identification of workplace challenges that hinder efficient technical skills acquisition in technical training. My education background, work experience of fifteen years in non-teaching government work and teaching experience of more than fifteen years in various government training institutions across the country, greatly inspired me to pursue a research study on improvement of skills acquisition of trainees in welding and metal fabrications through employing active teaching and learning methods. Together with participants composed of trainees, teaching staff and administrative staff at Buhimba Technical Institute (BTI) in Hoima, challenges encountered in the instruction learning processes at BTI were collaboratively identified and workable solutions to address these challenges were sought through interventions of this study.

1.3 Statement of Motivation

The motivation for this study is based on Buhimba Technical Institute's vision statement which states "*To be the centre of excellence in technical and vocational education and training in Uganda*", the mission statement which states "*To provide quality and self-reliant graduates, in skills and knowledge responsive to modern market needs*" and the MOTO which states "*Hands On*". More so, my teaching experience of fifteen years and observations on the relationship between teaching and learning in institutions and the world of work, forms a core inspiration for undertaking this study. It is on this background that this study targeted at improving instruction learning processes for the enhancement of trainees' skills acquisition in welding and metal fabrication at Buhimba Technical Institute was conducted together with trainees, instructors and institute administrators. "Hands On" motto of BTI emphasizes learning by doing; hands-on instruction has a long and successful legacy in the sciences and math (Rillero, 1994) cited in (Teaching, 2013). By using hands-on instruction, educators are fostering the 21st century skills that trainees need to be successful, namely: critical thinking, communication, collaboration, and creativity. Hands-on activities encourage lifelong interest in learning and motivate students to explore and discover new things.

1.4 Situation analysis at BTI

Various methods and tools of data collection were employed during the situation analysis with the aim of triangulating the information (data) generated to ensure that the data collected is valid and reliable.

1.4.1 Work production process analysis

Work production process analysis was one of the methods that were employed to generate information on the teaching and learning of welding and metal fabrication. Welding and metal fabrications was one of the major courses that was earmarked by Government to be

established at BTI in Hoima district as Technical and Vocational Education and Training (TVET) is increasingly being viewed by government as a potential solution to the youth employment crisis. TVET's orientation towards the world of work and the acquisition of employable skills means that it is well placed to overcome the skills mismatch issues that have impeded smooth education-to-employment transitions for many young people (UNEVOC, 2013). Welding and metal fabrications is a separate academic department at BTI which is relatively equipped with modern welding and metal fabrication equipment that is used in conducting training on different welding processes, namely: Manual arc welding (MMA), Tungsten Inert Gas welding (TIG), Metal Inert Gas welding (MIG), Metal Active Gas welding (MAG) and Spot welding. The TIG and MIG are mainly used for welding products of aluminum, and stainless steels; MAG is a semi-automatic process which is used to weld mild steel, cast iron and other alloys and MMA is often used for welding of mild steel.

The curriculum for the National Certificate Course in Welding and Metal Fabrications was rolled out by Uganda National Curriculum Development Centre (UNCDC) in 2016 and assessed by Uganda Business Technical Examinations Board (UBTEB) for formal programmes and Directorate of Industrial Training for Non-formal programmes. Generally, the welding and metal fabrication course is suitable for both females and males; the overall enrolment at BTI as of October 2017 was thirty-four (34) trainees in the formal and non-formal programmes. The enrolment for the formal programme in year one was sixteen (16) trainees of which fourteen (14) were males and two (2) were females and year two was eleven (11) trainees of which ten (10) were males and one (1) was female totalling to twenty-seven (27) trainees in the formal program and enrolment in the non-formal was seven (7) trainees.

The welding and metal fabrications curriculum is comprised of various modules, including: Life Skills, Computer Applications, Welding Technology and Practice, Fabrication

Practice, Engineering Materials, Technical Drawing & AutoCAD, Real Life Projects, Industrial Attachments, and Applied Technician Mathematics. Accordingly, the delivery of this welding and metal fabrication curriculum requires new strategies of delivery in the 21st century in order to impart on trainees the desirable skills in welding and metal fabrications with proficiency in the trade and readiness for world of work in various fields nationally and internationally; for example, work in the oil and gas sector in the Albertine region and ongoing Hydro Power Construction works at Karuma water falls. Consequently, the delivery of the training requires an effective instructing strategy which is believed to be a source of critical thinking or inspirational disposition on the part of the students (Johanesse, 2012; Borinski, 2003) cited in (Yinusa, 2014). Teaching strategies utilized by teachers in technical and vocational education programme must also improve in line with the changing needs of the contemporary society, as cited in (EGNR, 2010).

Therefore, a situation analysis / work process analysis at Buhimba Technical Institute (BTI) was conducted with the stakeholders (13 trainees, 3 instructors and 3 administrators) to identify the key areas of concern within the teaching-learning process. During the interactions with stakeholders, a guiding critical question, “why are the trainees not able to achieve relevant skills in welding and metal fabrications at BTI?”, was used to guide the discussion in identifying the key areas of concern affecting the teaching learning process in welding and metal fabrication. Consequently, the following areas of concern in teaching and learning were identified during the situation analysis:

- a) Delay in delivery of materials,
- b) Few instructors,
- c) Inadequate tools and equipment,
- d) Improper safety,

- e) Lack of knowledge to handle fabrication machinery,
- f) Unfollowed time table,
- g) Inadequate hand-on practice on welding and metal fabrication,
- h) Lack of knowledge on delivery of content, and
- i) High cost on training.

During the situation analysis, it was discovered that Buhimba Technical Institute (BTI) being a new player undertaking training programs in technical and vocational education and more especially training welders and metal fabricators, had its primary stakeholders - the trainees - already grieved with fear and confronted with the likelihood of falling into the same suit as those who had graduated from the neighbouring institutions but had failed to be absorbed in the world of work even as it is proclaimed that there is absence of skilled Ugandan welders and metal fabricators in the construction sites that demand high level skills in welding and metal fabrication such as dams and oil and gas industry (Pepper, 2014).

The issues of concern regarding training of proficient welders and metal fabricators at BTI were very crucial since even the primary stakeholders expressed serious concerns during consultative focus group discussions (FGD) held during the study. The participants reported incidences of poor training in which even trainees in the welding and metal fabrications course did not have any practical lessons and some theoretical modules were totally not taught throughout the whole of term one and term two of year 2017 due to numerous hindrances. The participants generated numerous challenges during the FGD. The primary stakeholders (trainees) presented the evidence of a demonstration that happened at BTI on 7th July, 2017 in protest of the poor teaching learning process and altogether agreed for such evidences to be captured in this action research study.

Accordingly, the identified areas of concern at BTI were the causes of graduates not being able to demonstrate employable skills as required in the world of work. In line with this, a work processes analysis was conducted with a view to establish a deeper understanding into the work processes and competences required in producing competent welders and metal fabricators as illustrated in Table 1.

Table 1. Work Processes for training a Proficient Welder at Buhimba Technical Institute

S/N	Work Process	Tasks involved	Competences required
01	Admission of trainees	(a) Students apply (b) Joint admission selection (c) Names published (d) Issued with admission letters	(a) ICT skills (b) Communication skills (c) Record management skills (d) Administrative skills
02	Orientation of trainees	(a) Recognition of new trainees (b) Issue with rules and regulations (c) Introduction of staff to new trainees (d) Trainees tour institute campus	(a) Communication skills (b) Interpersonal skills (c) Administrative skills management (d) Interpersonal skills
03	Teaching – Learning	(a) Prepare schemes of work (b) Prepare instructional materials (c) Prepare lesson notes (d) Actual instructions	(a) Knowledge of subject matter (b) Pedagogical skills (c) Professional conduct/ethics (d) Time management skills (e) ICT skills
04	Assessment and Evaluation	(a) Class work /continuous assessment (b) Present feedback to trainees (c) Give project work (d) Set and moderate examinations (e) Conduct termly assessment (f) Give termly progress report	(a) Subject knowledge (b) Professionalism (c) Communication skills (d) Time management (e) ICT skills
05	Graduation	(a) Trainees' clearance with administration (b) Short listing graduands (c) Award of certificates (d) Pass out of graduands	(a) Customer care (b) Good public relations (c) Communication skills (d) Good public speech



(a) Situation analysis discussion



(b) Clarification of issues during situation analysis

Figure 1. Interaction with stakeholders during a FGD at BTI on 23rd October, 2017

1.4.2 Futures Workshop conducted

A Futures Workshop (FW) is a tool used for problem identification in a given setting. The Future Workshop was employed in this action research study to identify in teaching-learning challenges in a participatory and collaborative manner in which all the key stakeholders were actively involved in generating ideas and participating in other activities assigned to them. The future workshop was held on 7th February 2018 at 10:00 am in the board room at BTI. The future workshop procedures that were followed involved key five phases, namely: (a) preparation phase, (b) critique phase, (c) utopia or fantasy, (d) reality phase, and (e) implementation and evaluation.

(a) Preparation phase

In the preparation phase, the researcher set the date, venue and informed participants; refreshments and special lunch were organized since the schedule of the FW was planned to take several hours of the set date. Also scholastic materials (manila papers, markers, masking tape, flip charts) and the agenda to guide the process were prepared.

(b) Critique phase

In the critique phase, critical challenges faced during the teaching and learning process in welding and metal fabrications at BTI were discussed. A critical question was set as “*what brings about poor skills acquisition by trainees in welding and metal fabrications at BTI?*” and the critical question was posed to the participants for in depth discussion; the discussion by the participants was evidently recorded as shown in Figures 2 and 3. The discussion in this phase was guided by the set ground rules agreed by all the participants in the session, the ground rules included:

- (i) Respect for one another/ Ideas of everyone should be respected,
- (ii) First idea generation,
- (iii) Short responses,
- (iv) No criticism, and
- (v) Transparency and Democracy.



Figure 2: Critique phase of the Futures Workshop held at BTI on 7th February, 2018



Figure 3: Discussion with stakeholders during critique phase at BTI on 7th February, 2018.

During the critique phase, the brainstorming technique was employed as a tool for soliciting ideas, generating the critical challenges affecting the instruction–learning process which the stakeholders pointed out and discussed. The participants raised numerous challenges which were all subjected to in-depth discussion in the future workshop held on 7th Feb, 2018

in the board room at BTI. During the future workshop discussions, one of the trainees expressed dissatisfaction with the poor skills acquisition in welding and metal fabrication which he attributed to poor instruction approaches and in his own words said that: *“...he rather be taught than have materials in place, when the instructor expresses him/her self-using varied instruction approaches one can be able to achieve the necessary skills and knowledge...”*.

In support of the trainee’s view, one participant on the side of instructors lamented that;

“Varied teaching/ instruction approaches are very vital for skills acquisition because they demand usage of different skills and comprehensive knowledge. That even if teaching/ instructional materials are available in store but when instructors do not know how to utilize them or if they are not put into use, their effect will not be felt on the ground”.

Another instructor shared their experiences of improvisation when they had a challenge of either delayed or no facilitation for industrial training and they had to sacrifice their small savings in favour of the trainees. The generated challenges shown in (Table 2) were listed on displayed manila papers pinned on the walls to be viewed and for clarity to all participants. In accordance to those experiences shared, the stakeholders in agreement decided to improve project based learning to address the challenges in skills acquisition in welding and metal fabrications at BTI.

Table 2. Challenges Generated during the Futures Workshop at BTI on 7th February, 2018

(i) Inadequate training materials	(x) Poor welfare for both instructors and trainees
(ii) Poor communication	
(iii) Poor teaching methods	(xi) Power challenge
(iv) Poor administration	(xii) Few instructors
(v) Delayed purchase of instructional materials	(xiii) Poor storage of instructional materials and tools
(vi) Poor time management	(xiv) lack of incentives and poor motivation
(vii) Inadequate tools and equipment	(xv) poverty or failure to pay the tuition fees
(viii) Poor sanitation	
(ix) Need for refresher courses for instructors.	(xvi) poor meals,
	(xvii) inadequate accommodation,

The key critical challenges generated by the stakeholders during the discussion in the critique phase were grouped/categorized into short term, medium term and long term challenges as indicated in the (Table 3). The short term challenges were clustered as follows: Poor Administration, Inadequate training materials, Poor instruction methods, Poor sanitation, Poor time management, Delayed purchase of instruction materials. The participants chose to deal with the short term challenges since these were manageable and tended to be of similar category.

Table 3. Generated challenges of Welding training at BTI on 7th February, 2018

Short term (3 months)	Medium term (3 - 6 months)	Long term (1 year & above)
1. Inadequate training materials 2. Poor communication 3. Poor teaching methods 4. Poor administration 5. Delayed purchase of instructional materials 6. Poor time management 7. Inadequate tools and equipment 8. Poor sanitation	1. Need for refresher courses for instructors 2. Poor welfare 3. Power challenge 4. Few instructors 5. Poor storage of instructional materials and tools	1. Lack of computers (ICT class) 2. Noise pollution from workshops 3. Poorly stocked library 4. Poor accommodation

(c) Fantasy phase

In the Fantasy phase, the participants tried to imagine and draw out an exaggerated picture of the future possibility of the challenges identified in the critique phase. The ideas were gathered and put to an “idea store” regardless of their practicability. This was the stage where the participants fantasized that the negative ideas identified during the discussions and more specifically those chosen in the short term were turned to be positives in which every situation was assumed to be possible and resources were available to settle every challenge experienced during the teaching learning process.

The clustered short term challenges were examined as follows:

- i. Methods of teaching should be able to equip trainees with relevant skills;

- ii. Administration should be transparent in the running of the institution;
- iii. Instructional materials should be delivered timely for effective delivery of instruction and learning;
- iv. Students and instructors should observe time according to the time table;
- v. There should be enough training materials availed for teaching and learning processes;
- vi. Proper hygienic conditions maintained in the compound.

In regards to the fantasy phase, the assumption was not realistic since the resources were scarce and all stakeholders had to prioritize the most pressing challenges that could be managed within their means. Accordingly, it prompted the participants to move to the reality phase which is an ideal situation so as to get the most pressing challenge affecting the trainees' skills acquisition in welding and metal fabrications.

(d) Reality phase

It was an ideal situation in which together with stakeholders (trainees, instructors and administrators) agreed to deal on with the short term challenges identified and which can easily be handled with minimum resources available. These challenges were ranked depending on what was most pressing and attainable in short term. At this stage, the participants used a pairwise matrix ranking tool and guided by the researcher on how to come up with the most pressing challenge out of the identified short term challenges as shown in Figure 4.



Figure 4. The activity of Pairwise matrix ranking during a FW at BTI on 7th Feb, 2018

The identified short term challenges were subjected to a pairwise matrix ranking to get the most pressing challenge responsible for poor trainees' skills acquisition was done and the results of pairwise ranking were presented in Table 4. Using pairwise matrix, the participants ranked the challenges and poor instruction methods scored the highest tally of five (5). This was then ranked to be the 1st and most pressing challenge responsible for poor trainees skills acquisition in welding and metal fabrications followed by poor administration scored four (4) and was ranked to be 2nd pressing challenge. The challenge identified with the highest tally was considered to be the major research problem in the study. It was out of the results of the pairwise matrix ranking that, a major problem of poor teaching methods was identified as a key challenge affecting the trainees' skills acquisition in welding and metal fabrications. Therefore, we agreed on the Research Topic as; Improving Project Based Learning to enhance trainees' skills acquisition in welding and metal fabrications at Buhimba Technical Institute in Hoima District. Participants agreed on research topic out of the identified most pressing challenge.

The participants also agreed to draw up an implementation action work plan scheduling the activities to be carried out by all the stakeholders at BTI.

Table 4. Ranking Challenges using Pairwise Matrix Ranking Tool at BTI on 7th Feb, 2018

	Inadequate training materials	Poor instruction methods	Poor sanitation	Delayed purchase of instruct.	Poor administration	Poor time mg't	Tally	Rank
S/N	1	2	3	4	5	6		
1		2	3	4	5	1	1	5 th
2			2	2	2	2	5	1 st
3				4	5	6	1	5 th
4					5	6	2	3 rd
5						5	4	2 nd
6							2	3 rd

(e) Implementation of an Action in the Study

In the reality phase, an action was drawn where the challenges with their possible workable solutions were stated, stakeholders' implemented solutions following an action work plan. The roles of trainees, instructors and administrators were clearly agreed upon. The role of the researcher followed up on action implementation by the responsible persons, tracked on what was being implemented and what had not worked well.

Table 5. The Action implementation work plan at BTI in 2018

S/N	ACTIVITY	RESPONSIBLE PERSON	DURATION
01	To explore the possible strategies that can be employed to improve PBL to enhance skills acquisition	Trainees, Instructors, Administrators and Researcher	7 th – 23 rd Feb, 2018 (2wks)
02	Implement strategies to improve PBL for skills acquisition by trainees	All as above	5 th Mar – 15 th May, 2018 (2 ¹ / ₂ months)
03	Evaluation of the impact of implemented activities	All as above and Mentor	21 st - 31 st May, 2018 (2wks)
04	Report writing and Editing	Researcher, Supervisors and Mentor	1 st Jun – 15 th October, 2018 (2 ¹ / ₂ months)

(f) Follow up on implementation of action work plan.

The follow up was conducted on the performance of trainees, instructors and administrators at BTI and to find out if there was any change and improvement revealed within the time frame of the action research from October, 2017 to August, 2018. This was done so as to determine the success or failure of the research project through the evaluation of the intervention strategies that were agreed upon during the FW with the key stakeholders. In that respect, the researcher had to use the action research cycle shown in figure 5.

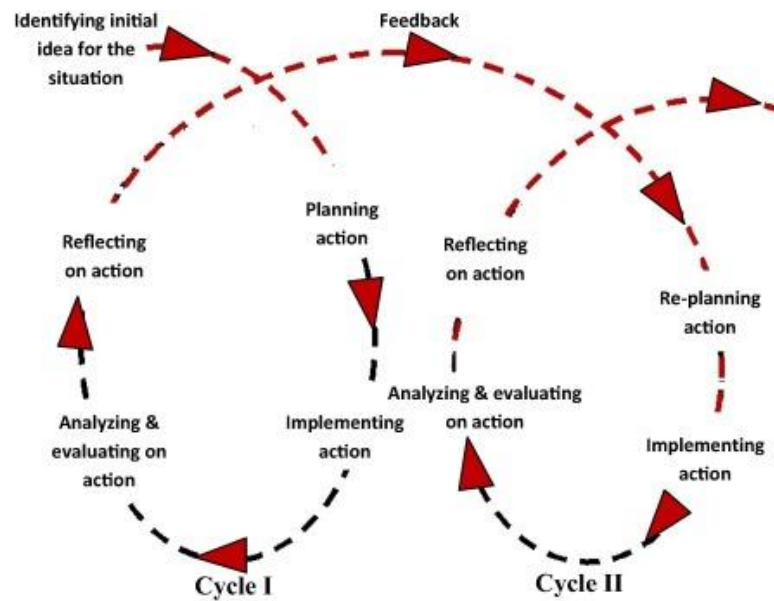


Figure 5. Action Research Cycle.

(Source: Abdel- Fattah, 2015).

1.5 Statement of the Problem

Teaching and learning of welding and metal fabrication require learner centered approach, where active teaching and learning methods are employed. This helps in active participation of learners in welding and metal fabrications course leading to production of competent welders and metal fabricators. The world of work requires dynamic and hands-on professionals whose expertise, competence and skills, depend on the kind of training they would have gone through in institutions.

However, in the department of welding and metal fabrication at BTI; there is noticeable laxity in engagement of active teaching and learning processes as it has contributed to instructors' preference of teacher centered approaches to teaching and learning rather than learner centered ones. This has left learners to lack practical skills, competences required in the world of work and students' motivation towards learning is affected due to lack of active participation and engagement with the content.

This therefore calls for strategies that would simulate the real life experiences that learners would experience once in the field of work. Activities like Health Safety Environment, Real Life Projects and improved Assessment of Real Life Projects, would make difference in learning. If this problem is not solved, the institution would continuously produce incompetent technicians in the world of work.

Therefore, it is on this note that, this Action Research sought to provide ways of improving Project Base Learning in welding and Metal Fabrication in order to produce competent technicians who will be highly skilled for world of work and self-reliant

1.6 Purpose of the study

To improve project based learning to enhance trainees' skills acquisition in welding and metal fabrications at BTI in Hoima District.

1.7 Objectives of the Study

- i. To explore the possible strategies that can be employed to improve PBL for skills acquisition in welding and metal fabrications at BTI.
- ii. To implement the identified strategies to improve PBL for skills acquisition in welding and metal fabrications at BTI.
- iii. To evaluate the impact of the implemented strategies aimed at improving PBL for skills acquisition in welding and metal fabrications at BTI.

1.8 Research questions

1. What strategies can be employed to improve PBL for skills acquisition in welding?
2. How can the strategies to improve PBL for enhancing skills acquisition, be implemented?

3. How can the implemented strategies to improve PBL for skills acquisition in welding, be evaluated?

1.9 Justification of the Study

The communities surrounding the project areas and the entire country expects institutions to have trained and produced proficient welders and fabricators in the country. It was on this that the society presumed that the welders and fabricators were trained using the relevant curriculum that met the 21st century needs of work places and being taught by highly skilled qualified instructors. Abban and Quarshie (1996) pointed out that the paradigm shift towards practical skills training with TVET in Africa is increasingly being reshaped to make it more attractive, efficient and effective. One of the most important features of TVET, as recognized by African governments, is its orientation towards the world of work with the curriculum emphasizing the acquisition of employable skills and occupational competencies cited in (Woyo, 2013). Despite the focus on instructing for improved standards in welding and metal fabrications, the report on graduates' absorption into the competitive 21st century job market especially into the foreign construction firms in our country revealed that their employability was still limited. Therefore, a need to identify better effective instructional strategies that are learner centered such that there are better vocational hands on instructions for the enhancement of trainees' skills acquisition in welding and metal fabrications at BTI.

1.10 Significance of the Study

This action research is of immense benefit in such a way that it assists the trainees, and employers of labour to become aware of the employability skills required to gain and retain employment. Enhancement of trainees' skills will enable graduates to meet the demands of the industry and be successful in the world of work. The study generates the knowledge on how to improve welding and fabrication training so as to produce competent craftsmen who can face

the challenges of the world of work occasioned by technological advancement. The study is also of immense benefit to the instructors since its worthwhile means of professional growth and development.

The action research x-rayed a wide range of skill needs of fabrication and welding by the industry thus help the teachers to infuse those skills in their instructions especially as most of work skills are not subject oriented. Therefore, this action research study would be used to fill the gap between theory and practice (Johnson, 2012) as cited in (Lavery, 2014). The study will be beneficial to the Curriculum Planners and the Government as it provides information about the existing gap in the graduates' non-technical competences and knowledge required for employment. Thereby providing a base for continuous improvement in the curriculum of fabrication and welding craftsmen in the technical institutes and other higher educational institution in order to make them consistent and relevant with the industrial needs in the modern workplace. Also Government would see the need to provide the needed resources for the acquisition of the non-technical and technical skills required for employment by graduates. The community at large would finally stand to benefit from the study if the identified skills are then included in the national instructors' college curriculum and other institutes of higher learning.

1.11 Scope of the study

The scope of the study refers to the parameters under which the study would be operating (Goes, 2013). The boundaries of the research are articulated in terms of; Geographical scope, Content scope and Time scope.

1.11.1 Geographical scope

This study was conducted at Buhimba Technical Institute, located along Hoima – Fort portal road and off at 18 km to the left from Buhimba Town Council. The area was selected since it's an institute involved in teaching of welding and metal fabrications.

1.11.2 Content scope

The research study was focused on the improvement of PBL in order to enhance the trainees' skills acquisition in welding and metal fabrications at BTI. Under this, the study employed three specific objectives. The first objective explored the possible strategies that can be employed to improve PBL for skills acquisition in welding and metal fabrications at BTI. Under this objectives, the researcher explored the observance of Health, Safety and Environment (HSE) and use of Personal Protective Equipment (PPE). The researcher further employed Training in MAG/MIG with a real life project and assessment of trainees' project work using a developed Assessment Training Package (ATP). The second objective implemented the strategies to improve PBL for skills acquisition in welding and metal fabrications and generated new knowledge. The third objective evaluated the impact of the implemented strategies aimed at improving PBL for skills acquisition in welding and metal fabrications.

1.11.3 Time scope

Action Research (AR) process at BTI began in October, 2017 in which we conducted situation analysis or work process analysis leading us to a future workshop conducted on 7th February, 2018 which took us to the next stage of implementation of the strategies identified. The implementation and evaluation process took on from June to August, 2018 and altogether with stakeholders re-plan for any better changes. The whole process is cyclic in nature as it involves stages of planning, acting, developing and reflection which greatly helps in continuous improvement of the situation at the work place.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents theoretical framework and the concepts under study, views, theories and concepts from different scholarly articles that are related to the subject under study. This study bases on Experiential Learning Theory, that is, learning by doing. It presents the aspects of Project Based Learning and skills acquisition in welding and metal fabrications.

2.2 Theoretical Framework

The theoretical framework of this study is based on Experiential Learning emphasized by David Kolb in 1984. Accordingly, trainees learn through direct hands on action or activity and carry that particular experience into future experiences (Dewey *et al*, 1994, p. 10) cited in (Goh, 2011). According to Kolb, learning is realized through four main aspects shown in Figure 6 which include: Concrete experience, reflective observation, abstract conceptualization and active experimentation. During the teaching and learning of welding and metal fabrication, learners are subjected to these learning aspects emphasized by Kolb in the following ways:

Concrete Experience: Under concrete experience, Kolbs suggests that learners should have an experience. In the context of this study, learners are exposed to various tools, materials and equipment, used in welding and metal fabrication. Tools and equipment like, welding machine, hacksaws, among others, are provided to learners to have an experience in handling. Effective learning requires learners to engage all the senses by physically allowing students to touch, feel, see, and even smell these materials, tools, and equipment, hence learning generating new knowledge and skills.

Reflective Observation: Kolb further suggests that learners ought to be encouraged by their teachers to observe while keenly reflecting on what they are observing. This would develop their abilities in relating phenomena under study.

Abstract Conceptualization: According to Kolb, content is always abstract, which requires learners to conceptualize these abstract ideas presented by their peers or teacher, into meaningful experiences.

Active Experimentation: As learners continue to engage with materials and tools, planning, trying out through experiments, is required. This helps not only in revealing new knowledge to learners but also in creating lasting practical experiences that would facilitate learning. Figure 6. Shows Kolb's experiential learning cycle.

Kolb's experiential learning theory is a basis for this study and is reflected in the relationships of the concepts under study. This is reflected in (Figure 6).

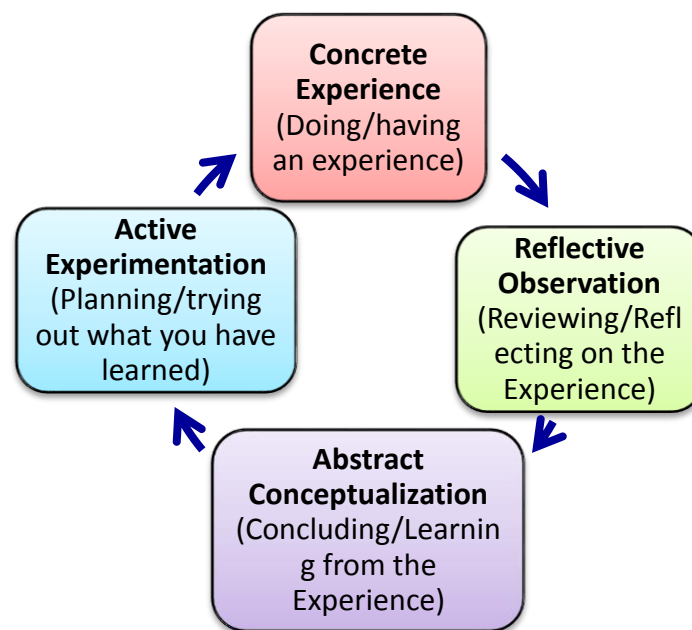


Figure 6. The Experiential Learning Cycle

Source: Secondary data (McLeod, 2013)

The theory emphasizes an interaction between learning method and materials hence learning by doing (Gill, 1991) cited in (Goh, 2011) see (Figure 7) for a conceptual frame work.

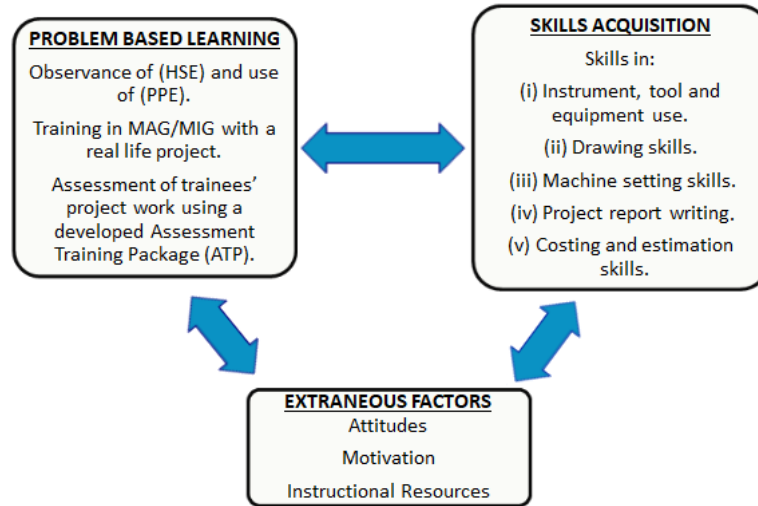


Figure 7. Conceptual framework at BTI in 2018

2.3 Project Based Learning (PBL)

A dynamic approach to teaching in which students explore real-world problems and challenges, simultaneously developing 21st Century skills while working in small collaborative groups (Stivers, 2010). PBL is a pedagogical approach that enables students to learn while engaging actively with meaningful problems. Students are given the opportunities to problem-solve in a collaborative setting, create mental models for learning, and form self-directed learning habits through practice and reflection. Vocational training institutions are encouraged to employ active teaching and learning methodologies.

This is supported by United Nations Educational Scientific and Cultural Organization UNESCO (2005) cited in (Abubakar, 2009), which states that Vocational and Science Education training is the primary agents for mobilizing communities towards sustainable development by increasing people's capacities to transform their visions for themselves and their society into reality. Therefore, there was need to identify better effective instructing strategies that are learner centered such that there are better vocational hands on instructions.

Despite the focus on instructing for improved standards in welding and metal fabrications, the report on graduates' absorption into the competitive 21st century job market especially into the foreign construction firms in our country revealed that their employability is still limited as it was proclaimed by a foreign contractor (Monitor, 2014).

According to the Monitor, (2017) cites the statement by Professor Bentil Kweku as saying "It is no longer relevant to teach 18th century material to children of the 21st century". 'Therefore, due to technological advancements, countries like Uganda should embrace change and move with the new times through training teachers on how to use new technology to access information and teach students'. In regards to that, the institutions in the 21st century are now supposed to be laced with a project based curriculum for life aimed at engaging learners in addressing real world challenges, issues important to humanity and questions that matter.

The current curriculum rolled out by Uganda National Curriculum Development Centre (UNCDC, 2016) emphasizes on active engagement of learners for better skills acquisition in all trades. The identified methods strategized for the instructions in technical and vocational education are of project-based learning / problem based learning, learning stations, learning contracts. The ATL techniques such as group work, brainstorming, presentation and demonstration, shared writing and storytelling and simulation and role play enable instructors and learners to put the chosen method of instruction or assessment into practice (MOES, 2014).

These teaching techniques are intended to make the students active (rather than passive) participants in learning. Many individuals learn best and become proficient in skills by practicing them rather than merely being a spectator to the skill, such as listening to the teachers talk about the skill, reading about the skill or watching others perform the skill (Herman & Toth, 2006) cited in (Momani, Asiri & Alatawi, 2016). Active hands on strategies coupled with learning activities are designed to take students out of their books, sometimes out of their seats,

sometimes out of their classroom, sometimes out of their school and sometimes out of their familiar ways of thinking (Silberman, 1996 and (Buehl, 2001) cited in (Momani, Asiri & Alatawi, 2016). Further states that; Active hands - on teaching strategies and learning activities are intended to make students active participants in their own learning.

In recent years, many African countries have been reforming the historically common teacher-centered curriculum, which employs a lecture style, 'learning by rote' method of teaching. Botswana, Kenya, Senegal, and others seek to promote creativity, critical thinking, and problem solving skills in their students (UNESCO-IICBA, 2011). However, learner-centered pedagogy (LCP) places the student at the center of the teaching and learning process. It focuses on students' needs, abilities, backgrounds, and interests with the teacher serving primarily as a guide and facilitator for learning. The approach marks a significant shift from teacher-centered pedagogy, where students take a more passive role as teachers transmit knowledge that students learn primarily through rote memorization. However, a range of teaching methods exists in Sub-Saharan Africa (SSA), and one should be cautious about setting up a dichotomy between transmission pedagogy and learner-centered pedagogy because teachers rarely utilize one approach to the complete exclusion of the other. A more realistic view of pedagogy is to conceptualize it as a spectrum of practices and perspectives that teachers move across with greater or lesser ease depending on their education, training, and experience (Barrett & Tikly, 2010).

The ATL methods that could effectively be employed as instructional strategies by the instructors are rooted in the experiential learning tradition and differentiated learning. Problem-based learning and Project Based Learning are those that roots in the experiential learning and attends to inquiry hence challenges learners to learn by solving problems presented in the form of case studies and simulations. As being the identified strategies in the

instruction of learners, it enables learners to be self-directed and to acquire lifelong learning skills. While employing ATL methods, the instructors are expected to employ appropriate ATL techniques which enhances the whole teaching-learning process. However, the Learning Stations and Learning Contract are strategies that are best suited to differentiated learning. Learning stations (also called ‘corners’ or ‘activity centres’) are specific areas in a classroom where learners rotate from station to station to complete an educational task using different approaches. Learning contracts are formal written agreements between teacher and learners, detailing what is to be learned, how it will be learned, and how the learning will be verified (Ministry of Education & Sports, 2014).

Subban, (2006) cites Tomlinson (2005), who defines differentiated instruction as a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests and learning profiles. Differentiated instruction (DI) is an approach to teaching and organizing a classroom that respects each learner and provides a variety of learning opportunities, thus enabling all students to meet success. It presents multiple paths for children to access information, make sense of it, and demonstrate their learning. The differentiated classroom provides flexibility in the curriculum and a variety of instructional strategies. Everyone in the classroom is engaged in the same general content while interacting with the subject matter at his or her own level. Teachers guide the process, monitoring students’ progress and offering direct instruction, guidance and support as needed, working with small groups or individual children. Differentiated instruction integrates knowledge about constructivist learning theory, learning styles, and brain development with empirical research on influencing factors of learner readiness, interest, and intelligence preferences toward students’ motivation, engagement, and academic growth within schools (Tomlinson & Allan, 2000). The effectiveness of all education

system depends largely on the quality of teaching and learning in the classroom, workshops, laboratories and other places where education takes place. For effective teaching and learning to take place, skillful teachers need to use variety methods and techniques at their disposal. Accordingly, during my Directed Vocational Studies (DVS) and through the Focus Group Discussion (FGD) held with the participants, the identified most effective strategy was Project Based Learning / Problem Learning Based (PBL) as one of the suitable employed method in the teaching of both theory and practical lessons in welding and metal fabrications.

According to Force and Gravells, (2010), PBL is the most effective active learning method known to make a positive impact on the learners' experience. As far as PBL was being implemented in the teaching learning process, the instructors in welding and metal fabrications had inadequate pedagogical skills in implementing the method since they had not got any induction training on it as cited in (Sada, 2015). In that respect, the instructors could not give the clear distinction between the old tradition method of teaching and the current strategy on PBL for active teaching and learning. The need for PBL in TVET teaching and learning stem from the fact that teaching and learning in TVET has to do with world of work and the practical application of learning and skills. The PBL approach has proven to be effective in the teaching and learning of technical and vocational trades. However, in technical and vocational training, most instruction is work oriented. For this to be achieved the learners must be exposed to active teaching approaches such as Project Based Learning / Problem Based Learning. Increasingly learners who are being taught using traditional methods appear to be disconnected from their studies. The characteristics of the millennium generation include 'digital literacy, experiential and engaging learning, interactivity and collaboration, immediacy and connectivity. Education can no longer be exclusively based on the teacher "disseminating information/knowledge

through lectures and PowerPoint slides”. Shift away from the teacher-centred learning paradigm means moving to a more learner-centred constructivist paradigm of education.

The learner now needs to focus on understanding, constructing knowledge, discovering and active engagement whereby they view the teacher or lecturer as a mentor or guide, this cited in (Sada, 2015). The effectiveness of PBL is seen in the benefits it offers to learners, as an alternative to traditional methods (Robbs & Meredith, 1994): An increased retention of information; The development of an integrated (rather than discipline-bound) knowledge base; An encouragement towards lifelong learning; A greater exposure to expert experience at an earlier stage in the curriculum; An increased learner-teacher liaison; and an increase in overall motivation. PBL also offers opportunities for learners to learn in teams, develop presentation skills, learn negotiation abilities and develop research skills and many other abilities as cited in (Sada, 2015).

2.4 Skills acquisition in welding and metal fabrication

Ochiagha, (1995) defined skill acquisition as the process of demonstrating the habit of active thinking or behaviour in a specific activity. He further stated that skill acquisition is seen as the ability to do or perform an activity that is related to some meaningful exercise, work or job. He maintains that for skill to be acquired, appropriate knowledge, attitudes, habits of thought and qualities of character are learnt to enable the acquirer develop intellectual, emotional and moral character which prepares him or her for a brighter future cited in (Idoko, 2014). Accordingly, Magbagbeola, (2004) cited in (Idoko, 2014), posited that skills acquisition requires the accumulation of different skills that enhances task performance through the integration of both theoretical and practical forms of knowledge.

By using hands-on instruction, educators are fostering the 21st century skills that students need to be successful: critical thinking, communication, collaboration, and creativity.

Hands-on activities encourage a lifelong love of learning and motivate students to explore and discover new things. It is important to keep in mind that lifelong learning has probably never meant only one thing but has always been a ‘composite’ concept. Aspin & Chapman, (2001), cited in (Biesta, 2006), who argued that lifelong learning represents three different ‘agendas’ and hence can serve three different functions or purposes, which, in their words, are: Lifelong learning for economic progress and development; Lifelong learning for personal development and fulfilment and Lifelong learning for social inclusiveness and democratic understanding and activity.

Lifelong learning as the learning that goes on throughout one’s life, that is, the learning that is connected to one’s life and the learning that takes place beyond the initial phase of formal education, then there is indeed an aspect of lifelong learning that has to do with the acquisition of new skills and knowledge in relation to the world of work, something that is important both for one’s own employability and financial well-being and for the well-being of the economy as a whole; this can be called the economic function of lifelong learning. There is also a dimension of lifelong learning that has to do with personal development and fulfilment, not only in terms of developing one’s potential and talents, but also in terms of learning from the encounters and experiences that make up one’s life, finding the ‘meaning’ of one’s life, and maybe even learning to live one’s life in a better way; this is the personal dimension of lifelong learning. Thirdly, there is a dimension of lifelong learning that has to do with democracy and social justice, with the empowerment and emancipation of individuals so that they become able to live their lives with others in more democratic, just and inclusive ways – which, again, is not only important for the well-being of individuals but for the quality of democratic life itself as well (Biesta, 2006).

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methodology used to collect data and data analysis procedure for the study. It indicates research design, area of study, population sample and size, sampling technique, data collection methods and tools used, data collection procedure, ethical considerations. The overall aim of this action research was to identify and explore the factors hindering the trainees' skills acquisition in welding and metal fabrications at BTI. The research methodology facilitated the attainment of the objectives of the research study.

3.2 Research Design

Qualitative Research Design was chosen for the Action Research project for establishing the data on improving project based learning to enhance trainees' skills acquisition in welding and metal fabrications at BTI. The research study was qualitative and descriptive in nature and it was a participatory action research (PAR) using the future workshop approach. The approach of this kind of research emphasized participation, action of stakeholders which sought to understand the given world of work by trying to change it, collaboratively through reflections. Action research facilitates change through shared decision making involving; selecting the area of focus, collecting data, organizing data, analyzing and interpreting data, and taking action. The future workshop as a tool of research was used. The future workshop has the following phases: preparation, critique, fantasy/utopia and reality/implementation phase. This is as supported by scholars cited in (Vidal, 2005).

Shank (2002) cited in (Ospina, 2004), defines qualitative research as “a form of systematic empirical inquiry into meaning” (p. 5). By systematic he means “planned, ordered and public”, following rules agreed upon by members of the qualitative research community.

By empirical, he means that this type of inquiry is grounded in the world of experience. Inquiry into meaning says researchers try to understand how others make sense of their experience.

3.3 Research Approach

The study employed a Participatory Action Research approach because it allowed the stakeholders to freely identify the challenges hindering the trainees' skills acquisition through the situation analysis, future workshop and develop practical solutions to address them quickly and efficiently. The topic of study was generated through generation of ideas during situation analysis and future workshop and data was collected through meetings and discussions at BTI. This was as supported in scholarly write ups cited in (MacDonald, 2012) and (Morales, 2016).

3.4 Area of study

The action research study was carried out at Buhimba Technical Institute in Hoima District in which the study was targeting the trainees of welding and metal fabrications, Instructors in the welding and metal fabrications department and the Administrators of BTI. The researcher found it convenient to carry out the action researcher at BTI since he was also a practitioner in the same department as well an Administrator and residing in the compound of BTI. That enabled the researcher to organize participants for the meetings and discussions where ideas were solicited and generated for the fulfilment of the action research project.

3.5 Sampling Technique and Size

This involves identification and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with the phenomenon of interest (Cresswell & Clark, 2011) cited in (Palinkas, 2015). Selection of study participants was done purposively according to willingness of individuals and category of people to provide the required information needed and the phenomena under the study. In general, the population of the entire

Buhimba Technical Institute according to records got from the principal's report of General PTA Meeting held on 6th July, 2017 was at 255 trainees in total in the institute as of the year 2017 for all the departments. 133 trainees on formal programs in all seven course offered and assessed by the UBTEB and 122 on Non-formal programs assessed by DIT. The total population of formal year trainees as of October, 2018 is 128 covering all the seven courses offered at BTI

The BTI staffing totaled to 42 – teaching staff 18 and 24 non-teaching staff. It's on this that, the researcher being one of the practitioner in the welding and metal fabrications choose to conduct the research with the ultimate goal of improving the teaching and learning processes in the department of welding and metal fabrications at BTI. The population for the study comprised of all the instructors in the department of welding and metal fabrications, all the trainees in year one 2017 and administrators. The key primary stakeholders in the study were selected basically focusing on the teaching - learning of welding and metal fabrications as indicated in the table below. However, five (5) instructors, fifteen (15) trainees were targeted to be selected because they were the key stakeholders and four (4) administrators as they were the key decision makers on some crucial issues which would need their attention and clarification. The identified participants then were approached by the researcher and requested to participate in the study and that was through a written consent as mandatory for enrollment for the study as presented in (Table 6).

Table 6. Composition of Study Participants at BTI in 2018

S/N	Category of population	Sample size		Sampling technique
		Target	Actual	
01	Trainees in welding and metal fabrications yr1	15	13	Purposive
02	Instructors in welding and metal fabrications	5	03	Purposive
03	Administrators	4	3	Purposive
	Totals	24	19	

3.6 Methods of Data Collection

In this study, the methods employed were as follows: Interview, Focus Group Discussion (FGD) and future workshop methods while collecting data for the study.

3.6.1 Interview

According to Kvale (1996, p. 174) cited in (Alshenqueeti, 2014) an interview is “a conversation, whose purpose is to gather descriptions of the [life-world] of the interviewee” with respect to interpretation of the meanings of the ‘described phenomena’. However, interviews -compared to questionnaires- are more powerful in eliciting narrative data that allows researchers to investigate people's views in greater depth (Kvale, 1996; 2003) as cited in (Alshenqueeti, 2014). Face to face interviewing was conducted where the researcher posed some questions to the participants more so the instructors and administrators on the challenges hindering the hands on training more especially in skills’ acquisition in welding and metal fabrications, their feeling towards it, possible solutions and the feedback that was recorded in the researcher’s log book.

The action research interviews were focused to selected groups of individuals at BTI that included the trainees of welding and metal fabrications, Instructors of welding and metal fabrications and Administrators. In support of this, Cohen *et al* (2007: 29) stated that interviewing is “a valuable method for exploring the construction and negotiation of meanings in a natural setting”. That is, the value of interviewing is not only because it builds a holistic snapshot, analyses words, reports detailed views of informants; but also because it enables interviewees to “speak in their own voice and express their own thoughts and feelings” (Berg, 2007, p. 96) as cited in (Alshenqueeti, 2014).

3.6.2 Focus Group Discussion (FGD)

Focus group discussion is a participative method that involves a homogenous group of respondents in the discussion of issues of common concern through a moderator. In this study focus group discussion was held with all the key participants in the study and this included; the researcher, first year trainees, Instructors from the Department of Welding and Metal Fabrications and Institute administrators. This is in line with what was posited by scholars cited in (Nyumba *et al*, 2018).

A specific topic for discussion was introduced, followed by guiding questions and the ideas and opinions of individual and group respondents were noted in the minutes as the process of research progressed. The research study focused on three groups arising from 13 trainees forming one group of FGDs, 3 instructors forming FGD and 3 administrators forming a FGD. The meetings were organized majorly after classes which was convenient for both the trainees and instructors. During the meetings, the participants discussed the challenges affecting skills acquisition in welding and metal fabrications, suggest possible solutions and how those solutions could be implemented to improve on skill acquisition to meet the demands of world of work.

3.6.3 Futures Workshop meeting

The Futures workshop meeting started with prior preparatory arrangements by all the key stake holders and set date for critiquing the situation for in-depth understanding of trainees' skills acquisition in welding and metal fabrication. In the process of conducting a FW, a brief introduction of the purpose of the gathering for FW, benefits of the action research project being undertaken in the department of welding and metal fabrications, the guiding principles or ground rules of the action research were [resented. The ground rules presented during the future workshop were: collaborative, first idea generation, no criticism, short responses, democratic, equity, respect for one another and transparency and this were explained to the stakeholders. That aligned with what was stated by scholarly, Robert Jungk (1913), cited in (Vidal, 2005).

3.6.4 Participant Observation

Defined as a special interest in human meaning and interaction as viewed from the perspective of people who are insiders or members of particular situations and settings (Ljorgensen, 1989). The insiders' view point; In the course of daily life, people make sense of the world around them; they give it meaning and they interact on the basis of these meanings (Schutz, 1967; Blumer, 1969; Denzin, 1978) cited in (Ljorgensen, 1989).

In this method, the participants were involved in recording all those phenomena which were visible to the human eye. The researcher being practitioner in field of study as well as a participant in the research lived with the key participants in the community of practice and was able to listen and took notes of the events that took place but most especially in noting how the strategies were being implemented at the institution during the research study. This will help in triangulating the information that will be got from other methods. In this way, the researcher

observed the trainees' participation in the different activities, particularly during the implementation phase using the observation tool that was designed.

3.7 Data collection tools

The tools used for collecting data in this study included: interview guide, logbooks, future workshop guide, still photo camera, and video cameras. The different ways in which each of these tools were used are explained in the following sections.

3.7.1 Interview guide

The interview guide was formulated based on the situation analysis and research objectives for gathering information from the participants because they provided subject areas within which the researcher was free to explore by asking probing questions. This was opted for as this approach would create confidence and co-operation between the researcher and stakeholders, and that eased the researcher's work in obtaining vital information.

3.7.2 Log books

Log books provide the study with "snapshots of particular social spaces, embodied and emotional practices in the making" (Morrison, 2012, p.74) cited in (Meerkerk, 2017). The daily activities were recorded indicating experiences obtained. This covered all activities including dates the resolutions made by the participants and work plans and suggest the way forward. Log book is used for keeping a record of what happens, why and where your ideas evolved. The reflective process involved in writing a log book contributes to the professional development of the researcher. McBrien, (2008) indeed found out that the Log books kept by Tutors provides good entry point into their personal experience cited in (Meerkerk, 2017).

3.7.3 Futures Workshop guide

Future Workshop (FW) was used as problem identification tool and critically analyze the area of concern. That helped the stakeholders to establish the most pressing gaps and lay strategies to address them. The FW was used as a tool in this study because it was aimed at guiding participants in identifying common problems, generating ideas, collaboratively generate workable solutions within the work place in order to improve on the situation in welding and metal fabrications at BTI.

According to Jungk and Mullert, (1987), a “classic” Futures Workshop consists of four phases cited in (Lauttamaki, 2014). In that regard, Futures Workshop has procedures to be followed, thus involves four phases; the preparation phase, critique phase, fantasy phase and reality phase. To this, a critical question is posed to the participants for discussion during the critique phase.

This tool was used because once the stakeholders are directly involved in the process, they are often recognized as being the best actors to make suggestions about improvement in their own work places. Empowering them by counting on their opinions provides them with authority, responsibility and accountability for required decisions (Jose, 2004).

3.7.4 Cameras / Videos

The participants used cameras to collect the evidence of the research through taking photographs and videos. Smart phone cameras were also used for gathering information during the action research project at BTI. Researchers have used video (and before that film) for many years particularly in workplace studies (Heath, Luff, Hindmarsh, 2010), the learning sciences (Goldman *et al*, 2009), and the home (Norris, 2004; Goodwin, 2000). Studies have used video to ask questions in a variety of sites including how social class and race are articulated in the school classroom (Mehan, 1979) as cited in (Jewitt, 2012).

3.8 Validity and Reliability of instruments

Validity in research refers to how accurately a study answers the study question(s) or strength of the study conclusions. Validity therefore implies that, what we want to obtain is what we are supposed to measure (Sullivan, 2011). In light of this, it was important to ensure that there was consultation and collaboration with supervisors and other experts in the study area for the purpose of developing items of the instruments which were used to collect accurate and desired data.

Reliability refers to whether an assessment instrument gives the same results each time it is used in the same setting with the same type of subjects. Reliability essentially means consistent or dependable results (Sullivan, 2011). In this study, there was pre-practiced focus group discussion and interview methods with different individuals to see whether the key questions can easily be understood and see whether they can bring useful answer.

In this study, several sets of data collection tools on work processes were designed at BTI. These tools were later presented to the supervisors and key stakeholders, who provided their guidance in relation to collecting relevant data aimed at answering the study question set. After collecting the data, expert opinion from the module coordinators was sought to ensure accuracy and consistency of the data collected. Following the interviews and FGDs from the situational analysis, data collected was analyzed and comments that were generated during the interview on aspects that seemed unclear to the key respondents. Adjustments were made in line with what was relevant to the work process. Similarly, reliability was guaranteed by triangulation of data collection methods namely; interview guide, FGDs and observations from future workshop.

3.9 Data collection procedure

In the process of the action research project carried out, the data was collected using the future workshop model and that involved the four phases, that is, preparation, critique, utopia/fantasy, reality/implementation phase and feedback. In the process the participants were urged to identify the challenges hindering trainees' skills acquisition in welding and metal fabrications. During the future workshop the participants identified the key short term challenges affecting skills acquisition and were as follows: Poor Administration, Inadequate training materials, poor instruction methods, poor sanitation, poor time management and delayed purchase of instruction materials. To this, the participants were tasked to decide on which of the training challenges required more attention by comparing each by the other challenges and by that the most pressing one was selected. In this process, poor teaching method was selected to be most pressing issue affecting skills acquisition in welding and metal fabrications. It was also clear by use of pairwise matrix, in which poor method of teaching was ranked position one since active teaching method in the instruction of welding and metal fabrications was not handled very well leaving gap between trainees and world of work.

The challenges of inappropriate practical training to make learners relevant to the world of work (WoW) were identified thoroughly through discussion with the participants. This activity was performed through focus group discussion and brainstorming where general and critical questions concerning the problem were posed to the participants. The participants selected the most serious challenge which could be solved first. This serious problem was selected democratically with all the stakeholder. In the utopia phase the participants provided various solutions to the selected challenge of poor instruction method irrespective of limiting conditions like funds. In the reality phase, the participants selected the most suitable applicable

strategies to the challenge. These were then recommended for the implementation and a work plan for the implementation was drawn by all the participants.

3.10 Data analysis

The data from the interviews and FGDs was analyzed by coding it manually. That was done after identifying the key themes and sub themes following the action research objectives. The responses to the open ended questions and other schematic data from interview findings were coded, edited, arranged and analyzed. The data which was got was descriptively presented which was used for institutions decision making, comprehensive interpretations and other related suggestions. Qualitative data obtained gave the researcher to critically analyze and synthesize the emerging ideas, opinions and beliefs with what other researchers or writers had mentioned in the literature reviews.

3.11 Ethical considerations

The ethics in the conduct of the Action Research were considered. Being an MVP student at Kyambogo University, a formal permission was sought from administration, that is, got an introductory letter from the faculty of Vocational Studies, department of Art and Industrial Design of Kyambogo University and presented to the stake holders to allow carry out research at Buhimba Technical Institute in Hoima District so as to avoid bias and give focus of the study.

The information which was obtained from the participants was kept confidential and it would be used only for research purpose. The names and the identities of participants were kept confidential. Taking photographs and recording of the participants' voices was through their consent and willingness. There was free discussions and every one's idea was considered. No one was victimized because of his/her view.

3.12 Limitations

The researcher faced challenges of financial as there were a lot to be organized during future workshop meetings and movements to and from work place and university.

The researcher also faced challenge of allocating time for duties at work place and research work. That is to say, balancing the work schedules at place of work and time for research became a big challenge. Time taking the real life project from inception to creation of a culminating product took weeks and also the commitment of the participants was more challenging

CHAPTER FOUR: ACTION IMPLEMENTATION & EVALUATION OF STRATEGIES

4.1 Introduction

The findings from implemented strategies which were collectively developed by all stake holders in the future workshop discussions are presented in this chapter. The purpose of the study was to improve Project Based Learning (PBL) as a strategy of enhancing trainees' skills acquisition in welding and metal fabrications at Buhimba Technical Institute, in Hoima District. Throughout the discussions, it was revealed that PBL needs improvement in order to facilitate learners' skills acquisition. Improving PBL as a method of active teaching and learning, requires active participation among learners and instructors. The key participants in the process of data collection were trainees, instructors and administrators of BTI. During the future workshop, a number of strategies aimed at improving PBL were suggested, among which were; observance of Health, Safety and Environment (HSE) and use of Personal Protective Equipment (PPE), training in MAG/MIG with a real life project and assessment of trainees' project work using a developed Assessment Training Package (ATP) Tool. This chapter therefore, presents the results of the actions of implemented strategies.

4.1 Action strategies implemented for Project Based Learning

The action strategies identified in this study as having a potential to address the challenges observed in skills acquisition in welding and metal fabrications were generated in the fantasy phase through brainstorming; these identified action strategies included: Training in MAG/MIG welding with real life project, Field tour to industries and factories, Outreach training, Exhibitions, Convert welding workshop into production unit, and Up-skilling of staff in their trades to increase on level of competences, Sensitization on Health Safety and Environment (HSE) and use of Personal Protective Equipment (PPE), down load YouTube

videos and employ on MAG/MIG welding practices and other related workshop practices relevant to the project during the practical lessons and Assessment of trainees' project work in line with a developed Assessment Training Package (ATP). Among these identified action strategies only three action strategies were selected for implementation in this study due to limited time and resources for implementation; the three selected strategies included:

- i. Observance of Health, Safety and Environment (HSE) and use of Personal Protective Equipment (PPE),
- ii. Training in MAG/MIG with a real life project,
- iii. Assessment of trainees' project work using a developed Assessment Training Package (ATP).

4.1.1 Observance of Health, Safety and Environment (HSE) and use of PPE

Welding and metal fabrication requires observing health, safety and environment and personal protective measures. This involved sensitization of trainees on the importance of Health, Safety and Environment (HSE) in the workplace and use of Personal Protective Equipment (PPE). In this, the trainees applied safety rules and Regulations, routinely cleaned the work place following the cleaning roster, displayed safety signs, provided protective wear and first aid items to be in place. During the commencement of welding process, the participants were challenged to ensure that every person involved was to ensure safety of his or herself by making sure all have the necessary safety equipment and personal protective gears: protective welding shields, head protection, long sleeved cotton overalls and leather work boots.

The trainees in welding and metal fabrications were previously very reluctant in the observance of personal protection of themselves while performing workshop activities. The trainees at one time were spotted carrying out practical sessions without being on protective

gears, Figure 8 (a). Therefore, emphasis was put on observing Health, Safety and Environment (HSE) and all the trainees were to be on Personal Protective Equipment (PPE) at all times while carrying out practices in the welding workshop. The trainees coped up with the trend of ensuring maximum HSE needs and PPE as required in Rules and Regulations in welding and metal fabrications. Figure 8 (b).



(a)



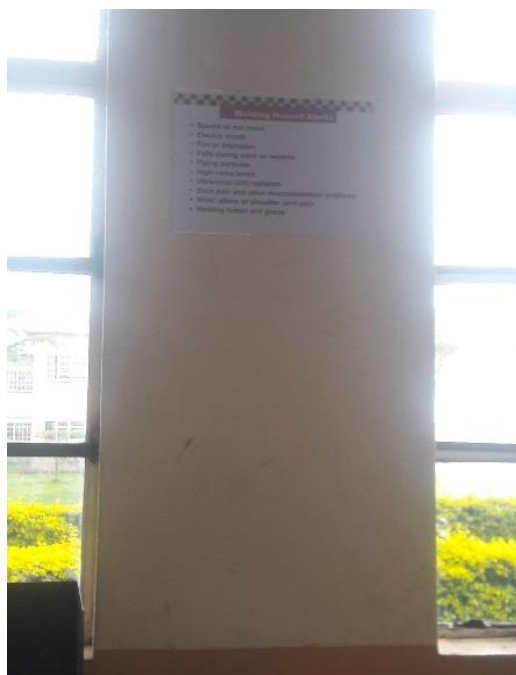
(b)

Figure 8 (a & b). Trainees before and after sensitisation on PPE respectively at BTI in 2018

During the future workshop, it was revealed that there was a challenge of safety both on a personal level and also environmental. The welding and metal fabrication workshops did not have signs to sensitise learners on the importance of health, safety and environment and use of personal protective gear. Stake holders agreed that trainees should design their own schedule for cleaning the workshop. Figure (9) shows a roster that students came up with, to be followed in cleaning the workshop.

BUSHIMBA TECH INSTITUTE	
TERM TWO-2018	
WORKSHOP CLEANING ROTA FOR	
WELDING AND METAL FABRICATION 2018	
1 st WEEK	
1	NALONDA WILLIAM
2	NATAMBA EMM
3	MURUNGI JOACHIM
4	MENDET BRAD
5	NGONZARWA MOSES
6	TUMANE ALUMWE
2 nd WEEK	
1	KANGEMBA GEORGE
2	STOBEREICH KENETH
3	KOBUSINGE FLAVIA
4	KAMUKA AMOS
5	STABASAJA ROGERS
6	KOTERA JEROME TALEMWA ALLEN
3 rd WEEK	
1	KEMBAZAI ALICE USILLA
2	BARUGAHARA JOSEPH
3	KYAMAHARA VICENT
4	KOJA WILBERFORCE OLWENO
5	MURUNGI WILLIAM
6	MWESIGWA WYCLIFF
4 th WEEK	
1	MASALI NOELINE
2	MUMWAZI OIDEEN
3	KAMUKA GABRIEL
4	BAGUMA EMMANUEL
5	MENDET ROGER
6	TWIMBUNDA NAAC

Figure 9: Cleaning Roster at Welding Department at BTI in 2018



(a)



(b)

Figure 10: Awareness of Health, Safety, Environment (HSE) and use of PPE at BTI in 2018

4.1.2 Training in MAG/MIG with a Real Life Project

The strategy of employing real life project was collaboratively agreed by participants as an appropriate approach that would enable trainees to attain multi skills in welding and metal fabrications. Before the commencement of the real life project, we had to identify the need which could be addressed by the project. The participants identified lack of welding tables in the workshop and need for compound seats under tree shades for academic group discussions. To that effect, fabrication of welding tables was chosen to be executed since tables were lacking in the welding department and were of serious need for welder trainees and instructors in the department. The specific activities undertaken in the implementation stage included:

- (a) Planning work/ drawing the product
- (b) Production of the real life product (carrying out welding)

(a) Plan work / drawing the product

This enabled the trainees to have prepared budget, delegated duties, prepared materials, identified materials, tools and equipment and interpreted the drawing. The participant agreed to assign members tasks in groups / teams: those who carried out the measuring and cutting of the metal pieces according to design drawing, those to assemble the pieces and tack weld and those who were positioned to precisely adjust and set the current and speed of the spool wire for proper joint welding. The identified work force had to work in teams and this was very cardinal in instilling team spirit among the participants. The trainees carried out the sketching and design drawing of the welding table and this activity was guided by the trainer as observed by the researcher.

Figure 11, shows the trainees when coming up with the drawing of the product to be produced during the project work undertaken in the department of welding and metal fabrications.



Figure 11. Researcher observing trainees drawing the product at BTI in 2018

In (Figure 11) the trainees are designing the product to be produced using the AutoCAD. This practice helps the trainees to achieve skills in AutoCAD which one of the key module in the TVET curriculum for National Certificate in Welding and Metal Fabrications examinable by UBTEB.



Figure 12. Trainer guiding trainees in designing product using AutoCAD at BTI in 2018

(b) The production of real life product: Carrying out welding

A steel welding table is a basic necessity for any welder's work space, since welding on the floor could create discomforting welding position of the welder. Also welding on a wooden surface could present a very real fire hazard. A welder's table, is provided with a welder's work clamp and parts placed on it will be electrically connected with the table's surface. The participants shared their experiences and collaboratively agreed to carry out the training in MAG/ MIG with production by integrating the action strategies selected (real life project, display of you – tube videos) for fabricating the real life products, that is, the welding tables.

We selected the appropriate tools and equipment and were: MAG/MIG welding machine, carbon dioxide filled gas cylinders and accessories, chipping hammers, wire brass, cutting tools (hacksaws, chisels, angle grinder and metal cutting discs), tape measures and try squares. The materials used for fabricating the welding table were steel materials of different specifications: 1/8" standard steel angle iron which were cut for stands and a 1/8" thick mild steel plate for the table tops. The identification and purchase of materials was done collaboratively by all the participants of the project. In that regard, it enabled the trainees to gain soft skills and competences of costing materials or generating bill of quantities, proper identification of materials and lobbying for support. The fabrication of the welding table was of its purpose to allow the welder to stand upright and place smaller projects at the right height for welding.

The welding and fabrication of the welding table took the following steps for the production of the final product: plan work / drawing the product / organise the materials, observe health and safety environment/work place and carryout welding of the product. The trainees at this stage selected the right welding current and speed of the spool wire. The trainees

made jig fixtures and fixed assembled pieces. In the process, the trainees spot / tack welded all the joints before commencement of full jointed welding and this allowed testing perpendicularity of table stands. These enabled trainees to build in skills of testing perpendicularity of table stands on ground.



(a)



(b)

Figure 13. Trainees cut materials, assemble cut pieces and setting the machine at BTI in 2018

The trainees carried out full welding to final finish on all the joints of welding table as shown in Figure 13. After which the welded parts were grinded with the grinder for achieving smooth surface. Hands-on learning experienced by the trainees during the practice enabled them to develop skills and competence as they employed different welding positions and use of advanced welding machine to fabricate the table and enabled them to build confidence in themselves.



Figure 14. Trainees on full welding of the table as guided by a trainer at BTI in 2018

The participants handled the welding of different thickness of metals as a practice in welding a real life product. The trainees finally grinded the welded parts to smoothen and carried out surface finish by filing and sandpapering see (Figure 15). This motivated the trainees and they looked forward to see the outcome of their effort as well to push on amidst the challenges they were going through. The study exposed the participants to the use and handling of various tools and materials in the world of work.



Figure 15. Trainees grinding / smoothening the product at BTI in 2018

4.1.3 Assessment of Trainees using Assessment Training Package (ATP) Tool

This involved assessment of trainees' project work in line with a developed Assessment Training Package (ATP) Tool. The relevant skills attained after training in MAG/MIG welding with real life project were assessed by use of modular assessment format for competence based training aligned with the developed Assessment Training Package (ATP) see (Appendix 9). The trainees were earlier assessed without critically looking at stages involved in the practice. The trainees attained multiple skills during training which were relevant in world of work, as shown in (Table 7).

Table 7. Skills achieved by trainees after training in MAG/MIG at BTI

S/N	Relevant skills achieved by trainees
01	Effective use of personal protective equipment
02	Costing of materials generated and correct selection of materials
04	Accurate selection of tools and equipment's
05	Interpretations and drawing accurate diagram
06	Daily maintenance skills of the machines
07	Setting skills of machines to suitable welding currents
08	Firm fixing skills of work pieces
09	Welding skills of varied material thickness at different positions
10	Use of measuring instruments
11	Competences on testing welded joints

Previously, the performance assessment tools lacked certain aspects that we considered important in developing learners' competences and skills. Aspects like preparing the materials and workplace and observance of safety were never highlighted as key aspects to be awarded scores in the performance assessment. The instructors in previous assessments were not emphasizing and capturing the critical aspects of stages in fabricating a product. Figure 16 (a) assessment capturing few aspects and Figure 16 (b) A designed tool currently employed by instructors to assess real life project and this could be manipulated to be applied for assessment of other workshop practical.

process, awareness was created in which there was display of workshop rules and regulations to be observed. Cleaning the environment (dustbins, collecting point for offcuts and developed a cleaning roster. A majority of trainees were satisfied with awareness of HSE and PPE which has helped them to improve on the general work environment and be on PPE at all times. This is indicated on (Table 8), in which eleven (11) trainees strongly agreed and two agreed that, the observance on HSE and use of PPE by trainees has impacted on the trainees' involvement in welding and metal fabrication practices (Table 8).

4.2.2 Trainees Feedback on MAG/MIG Welding with a Real Life Project

The trainees appreciated the mode of training which engaged them to participate in teams. Team spirit was inculcated in the trainees during project work. In this, trainees learnt to share responsibilities and cooperatively shared their experiences. Twelve (12) trainees strongly agreed and one (1) trainee agreed with real life project as mode of delivery since it engages individuals with different skills. In this the trainees exercised cooperative learning, shared their experience and the practice was hands on in which a real product was produced hence enhanced skills acquisition. This made it possible for them to even apply skills, knowledge, norms, attitude and experience to the world of work see (Table 8).

4.2.3 Trainees' feedback on use of Assessment Training Package (ATP) tool

These captured skills attained at each stage of practical work and emphasized on a process rather than a result. The trainees were encouraged to use it while assessing practical in real life production of the products especially the welding tables. Eight (8) trainees strongly agreed and four (4) agreed since it was a new competence based education and training tool for assessment of competences see (Table 8).

Table 8. Responses of trainees on MAG/MIG welding training at BTI

NO	STRATEGY	STONGLY AGREE	AGREEE	DISAGREE	UN- DECIDED
1.	Sensitize trainees on HSE and PPE in welding practices.	11	2	0	0
2.	Real life project as mode of delivery	12	1	0	0
3.	Assessment by use of Assessment training package (ATP)	8	4	1	0

4.2.4 Staff feedback on HSE and PPE in welding practices

Welding and metal fabrication requires appropriate health and safety measures put in place to help those practicing welding and metal fabrication. These safety measures range from personal, environmental and to those who access the facility. According to the Department of Labour (2006) welding poses a range of hazards to your health. These can be obvious straight away such as electric shock or exposure to cadmium fumes, or they may show up in the long term such as lung and breathing disorders. The Department of Labour (2006) further asserts that fumes generated by different welding processes may range from being of nuisance value to highly toxic. Health effects can occur very soon after exposure (e.g. exposure to cadmium fumes can be fatal within hours) or may not result until after many years. Fume control requires appropriate ventilation equipment and may require advice from a specialist.

In the same way, Zigulis (2015) contends that ventilation and respiratory protection may be needed, depending upon what exact work is being planned. Some standards require provision of fresh air ventilation depending upon welding application. Accordingly, general welding safety and health considerations that include electrical safety, proper PPE selection (including vision and skin protection), area control, hot work permits, and fire watches, should be observed.

This therefore required that a sensitization practice be conducted to help in awareness of such occupational hazards. The sensitization conducted was a success with majority participants strongly agreeing that sensitization was necessary and created some change especially in perception and responsibility among the stakeholders (see table 9).

4.2.5 Staff feedback on MAG/MIG welding with a real life project

Under this, PBL in real life project was seen to be a more effective way to cultivate a need to know in trainees and this motivated them to deepen their understanding in order to solve an existing problem of lack of welding tables in the workshop and that was meaningful project to undertake. This encouraged them to apply what they had learnt theoretically to relevant situations, leading to a better sense of understanding. In that respect, all six (6) instructors and administrator strongly agreed that, the Real Life Projects increased deeper engagement of trainees in learning and with the direct relevance of projects to real-life issues or problems as indicated in Fig. 9. The instructors and administrators also agreed to allocate more hours for practical lesson. Perfection in a particular skills needed more time for practice thus leading to proficiency in skills attainment.

4.2.6 Staff feedback on use of Assessment Training Package (ATP) tool

Employing performance assessment tool on real life project as a strategy was aimed at improving the project based learning to enhance trainees' skills acquisition in welding and metal fabrications. This revealed trainees' active participation and full engagement at all times throughout the allocated period for the real life project as all the trainees practiced in all the stages of production of the real-life product. In that regard, a majority of the participants as indicated in (Table 9) showed five (5) instructors and administrators strongly agreed and one (1) agreed that, carrying out performance assessment of the trainees on the real life production

boosted the trainees' skills acquisition in that every individual had hands on at all stages of production as indicated on records captured on the assessment performance tool.

Table 9. Responses of instructors and administrators on training of welders at BTI

NO	STRATEGY	STRONGLY AGREE	AGREE	DISAGREE	UN- DECIDED
1.	Sensitize trainees on HSE and PPE in welding practices.	5	1	0	0
2.	Real life project as mode of delivery	6	0	0	0
3.	Assessment by use of ATP (Assessment training package)	5	1	0	0

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents discussion and analysis of the results amassed from action implementation and evaluation presented in chapter four of this report. It discusses and analyzes the results which basically depended on my interpretation and description of the processes. These were based on the experience, observation and reflection, upon the situation as events unfolded in the process of research project. The perceptions and views from the participants of this research were also considered. In this discussion, the researcher integrated related views, theories and concepts from various scholars where it was deemed necessary to back up the analysis of the results. After discussing and analyzing the results, the researcher laid down conclusions based on his learning and understanding acquired through the research process and the recommendations which would reveal the way forward for this research project. The findings from research project were presented in comparative way of the stated objectives.

5.2 Discussion of the findings

The research sought to address the three objectives: to explore the possible strategies that can be employed to improve PBL for skills acquisition in welding and metal fabrications at BTI; to implement the possible strategies to improve PBL for skills acquisition in welding and metal fabrications; to evaluate the impact of the implemented strategies aimed at improving PBL for skills acquisition in welding and metal fabrications. Therefore, the findings are discussed in line with the objectives of the study under two themes; Relevance of PBL method as a strategy to enhance skills acquisition in welding and metal fabrications and complexities in implementing PBL method of instruction in welding and metal fabrications.

5.2.1 Relevance of PBL in Welding and Metal Fabrication training

Under this, the researcher discusses data that was considered relevant to Project Based Learning method as a strategy in enhancement of trainees' skills acquisition in welding and metal fabrications at BTI. The researcher employed focus group discussions, informal conversation interviews, interview guides with accompaniment of observation checklists that sought to discover the experiences of trainees, instructors and administrators in regards to skills acquisition in welding and metal fabrications. Project-based learning is a student-centred form of instruction which is based on three constructivist principles: learning is context-specific, learners are involved actively in the learning process and they achieve their goals through social interactions and the sharing of knowledge and understanding (Menzies, 2016).

In a focus group discussion, it was noted that welding and metal fabrications instructors were limited in employing modes of delivery which call for active teaching and learning. The researcher observed that the instructors could not differentiate between teaching methods and techniques. Instructors employed techniques such as demonstrations, discussions, role-play, lecture, talk and chalk which rendered students' passive during instruction and learning process. Project Based Learning, Learning Contracts and Learning Stations as instructional methods that call for active teaching and learning were not so much emphasised. For trainees to be competent in welding and metal fabrication, active teaching and learning methods are required. In regards, together with the stakeholders, considerations to drop instruction methods such as lecture, talk and chalk and demonstration was agreed upon so that the instructors could adopt experiential learning methods for instructions. In respect, the instructors adopted, a Project Based Learning (PBL) intervention called 'Learning through REAL Projects cited in (Menzies, 2016).

As a field, PBL is still in the developmental stage, for example, there is not sufficient research or empirical data to state that PBL is a proven alternative to other forms of instruction. Based on evidence in standards-based PBL, students are pulled through the curriculum by a Driving Question or authentic problem/project that creates a need to know the material. PBL can help you as a teacher create a higher performing classroom in which you and your trainees form a powerful learning community focused on achievement, self-mastery, and contribution to the community. Gathered over the past three years, PBL appears to be an equivalent or slightly better model for producing gains in academic achievement, although results vary with the quality of the project and the level of trainees' engagement. Also, PBL is not appropriate as a method for teaching certain basic skills such as reading or computation; however, it does provide an environment for the application of those skills.

Zancul, Sousa-Zomer & Cauchick-Miguel (2017) who cites (Fernandes *et al.*, 2014) holds that in terms of advantages of the PBL approach, learning by means of a project is likely to increase motivation, and give the students a sense of satisfaction. Zancul *et al.*, (2017) further cites (Edström & Kolmos, 2014) who agree that PBL is helpful for developing long-term learning skills, to develop deep, integrated understanding of content and process.

Project Based Learning allows students learn to work together to solve problems, and it promotes responsibility and independent learning. PBL also contributes to bringing the classroom close to the profession through the acquisition of knowledge while solving practical and real cases closed to the professional world. In fact, PBL works to integrate and apply: (i) structured new knowledge covered in the course, (ii) knowledge learned in other courses, (iii) prior life experiential based knowledge, and (iv) new self-taught knowledge (Zancul *et al.*, 2017).

Zancul *et al.*, (2017) cites (Dym et al., 2005) who highlight that there are many examples of the application of PBL in higher education. In the case of engineering courses, PBL does address one of the key components of engineering competence development, i.e. the ability to extend what has been learned in one context to other new contexts. The design is considered as one of the central functions of engineering practice, and project-based learning is a well-known methodology for engineering design education (Palmer & Hall, 2011) cited in (Zancul *et al.*, 2017). The achievement of evaluative skills critical in the design methodology is challenging; students should recognize that design involves a range of decisions with the validation of assumptions and justification of choices made. In fact, it is expected that students practice the design of solutions under realistic conditions, and PBL is valuable for that; however, many engineering curricula are still predominantly based on the traditional model that is heavy in mathematical analysis, and where design, if present, is often segregated.

It was observed that the reviewed TVET curriculum for technical and vocational institutes stresses that learners should be exposed to real life challenges through projects. This can best be handled through Project Based Learning method. Solomon (2003, p.2) adds that in PBL, the teacher's role no longer includes just delivering instruction or expecting students to repeat facts on tests. Instead, it is to offer resources that help students investigate and develop content purposefully and creatively. Learning is not about attempting to do the task but rather understanding and relating the content with practical experience. PBL therefore, helps trainees perform tasks to learn by constructing their own understandings in collaboration with peers which takes a process.

5.2.2 Complexities of PBL in Welding and Metal Fabrication training

In general, the complexity of an activity can be defined in terms of different factors (Sahaf, n.d). In the context of this study, complexities will be discussed under; application, planning and behavioral. These influence the use of PBL method of instruction in welding and metal fabrication at Buhimba Technical Institute. PBL method require availability of resources mostly instructional materials where learners would practically put them into use. In welding and metal fabrication, materials like mild steel, stainless steel, shielding gasses, welding wires and electrodes are required. As much as these instructional materials are required for successful training, their availability remains a complex issue. This stems from continued budget cuts and delayed release of grants. More so, other stake holders' contributions like parents' contributions are very meager. This has resulted into large numbers of trainees sharing the little available resources. If these are grossly lacking in the institutions, the products from them will not have the competencies directly required in the labor market. This makes instructors rely on improvisation hence less skill acquisition is imparted in the trainees.

BTI being among the BTVET institutions suffers from inadequate training material due to under funding by government. Similar situation has ever existed in National Instructors' College Abilonino in the department of welding and metal fabrication as experienced by the researcher. Instructor trainees engaged in welding and metal fabrications also faced challenges of inadequate training materials more especially in advanced welding practices in which trainees went throughout the course without being engaged in the advanced welding but only to be coached at the last week to examinations preparing them for final examinations. It greatly affected the learning as they did not acquire competences required of as an instructor. It was inappropriate to agree with inadequate training material in BTVET institutions, if our aim was to produce competent technicians with proficient skills in welding and metal fabrications.

Therefore, advocacy for adequate training materials in BTVET institutions was the way in which bridge the gap. In the bid to solve this for sustainability in provision of adequate training materials, we agreed with stakeholders to establish a production unit in the department which would act as an Income Generating Activity (IGA) for sustainability. In light to this, we also agreed to continue cost sharing whether for a government or private trainees at BTI. Trainees at BTI contribute fifty thousand shilling for training material to supplement the grant from government.

Similarly, the emergence of new technology for example advanced welding technology, which requires more training especially on the side of instructors, on the use of modern tools and equipment, has rendered PBL method hard to employ. Instructors require retooling to be able to handle the ever changing technological innovations. Machines like magnaflux for testing welds (see appendix 10), sheet rolling machine, bending machines, among others, required specialized training. Other complex issues affecting the effective use of PBL in teaching and learning of welding and metal fabrications, are planning and management issues. Buhimba Technical Institute, being a public institution works under Ministry of Education and Sports. Many times these institutions were faced with challenges stemming from poor planning and management. At Buhimba for example, requesting for materials to be used in teaching and learning under goes bureaucracy which in most cases delays the purchase of materials in time.

Teaching and learning of practical fields like welding and metal fabrication requires exposure in the world of work. This would help trainees relate schools' activities to world of work. However, the research project finding reveals inadequate study tour as another challenge; field practicum is intended to expose trainees to observable work processes through field practical experience. However, the funding of this activity by the institute remains cost burden to facilitate their effective implementation. For example, field work practicum is perceived as

being expensive and not provided for in the grant budget. For that matter, this activity is in most cases not promptly funded and the burden is normally thrown to the trainees to bare the whole cost. This was evidently revealed as of when the trainees themselves suggested and pressed for the field tour to be implemented in term two, 2018 and willingly contributed part of the cost of the tour but still BTI couldn't supplement on trainees' contributions since it had not been budgeted. The field tour couldn't take place and this was a hindrance to enhancement of trainees' skills acquisition in welding and metal fabrications. I strongly disagree with limited field tour as it does not expose trainees to what happens at world of work.

In support of this, Gretzel et al (2008), Wong and Wong (2008), Sanders and Armstrong (2008) cited in (Goh, 2011), reported field trips to have enhanced students' learning and increased their practical knowledge in the absence of actual work experience. Besides enhancement of student learning, field trips also benefit faculty members with valuable professional development experience (Porth, 1997) as cited in (Goh, 2011). In the bid to solve this together with stake holders we agreed to implement cost sharing to boost funding of that activity. It has been found that inadequate field tour has been a major hindrance to the acquisition of skills

Another form of complex issues that have influenced the use PBL in teaching and learning of welding and metal fabrication, are behavioral complexities. This is evident in trainees' attitudes and motivation towards the subject. Trainees lack enthusiasm in practicing welding and metal fabrication. This is mainly due to the fact that to most of them, the practice is being experienced for the first time in their lives. Most have developed fear especially about use of electricity. Cases of electric shocks, spatter welds and extra bright lights which sometimes cause burns and red eyes, leave a negative attitude towards welding and metal fabrication. It is therefore a complex issue to change trainees' attitudes towards the practice.

5.3 Conclusion

The purpose of this study was to improve project based learning to enhance trainees' skills acquisition in welding and metal fabrications at BTI in Hoima District. Basing on the three implemented strategies, which were; Observance of Health, Safety and Environment (HSE) and use of PPE; Training in MAG/MIG with a Real Life Project; And assessment of trainees using Assessment Training Package (ATP), a positive change towards improving PBL, was realized. Attitude of the instructors towards observing HSE and use of PPE according to the findings seemed to have evidently changed and this greatly motivated trainees to maintain safety standards at all times in the welding and metal fabrication department. This is based on the positive feedback from stakeholders. However, there are still challenges which need to be fixed if PBL is to enhance trainees' skills acquisition. According to the findings, key challenges affecting trainees' skills acquisition in welding and metal fabrications as per the responses of various participants were; inappropriate instruction methods, inadequate training material, delayed purchase of training materials, poor administration, poor sanitation, and poor time management.

5.4 Recommendations

Basing on the participants' views and responses from the strategies aimed at improving Project Based Learning, that is, Sensitization of trainees and instructors in observance of HSE and PPE, MAG/MIG training with real life project for fabrication of welding tables and employing Assessment Training Package (ATP) Tool. The recommendations suggested for further actions by the relevant stakeholders; that is, by having instructors with appropriate trade and pedagogical skills of instructions for welding and metal fabrications. Therefore, MOES needs to continue equipping instructors with trade and pedagogical skills for better delivery of practical skills in welding and metal fabrications. In regards to the findings in MAG/MIG

training with real life project fabrication of welding tables, the trainees need to practice it at their world of work and more time allocation for practical instructions, need to be implemented in a bid to solve the challenges at hand. Accordingly, institution need to allocate more hours for project work in the institute program

The Institution further needs to speed up startup of production unit for IGA, this would create sustainability of the department as the proceeds would be rolled for provision of training materials and motivation of trainees and instructors in the department.

The institution to uplift the standards of Health Safety and Environment (HSE) and PPE use since it's a key aspect of what is required for welding technicians in the world of work. Identify a staff to be in charge of HSE and he /she be provided with highly specialized training.

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APPENDICES

Appendix 1: Map of Uganda showing Hoima District where BTI is located



Figure 1. Map of Uganda showing Hoima District where BTI is located

Appendix 2: Action Research Work Plan

Table 1. Action Research Plan

S/N	ACTIVITY	TIME FRAME		COMMENT
		START	END	
01	Situation Analysis & Future Workshop	Oct, 2017	Feb, 2018	Done
02	Writing & defending Proposal	01/03/2018	30 th /04/2018	Done
03	Data collection	01/05/2018	30 th /05/2018	Done
04	Data Analysis	01/06/2018	31 st /07/2018	Done
05	Thesis writing and submission	1 st /08/2018	31 st /10/2018	Done

Appendix 3: Situation Analysis Tool and Interview Guide for Trainees and Instructors

A. Interview Guide for Instructors

Introduction

I am Elaru Patrick, a student at Kyambogo University pursuing a Masters degree in Vocational Pedagogy. I am carrying out an action research which is a requirement for fulfilment for the award of MVP. Through my experiences as a teacher and now with the knowledge I have attained during my study as a MVP student, I have come to realize that despite the existing training processes delivered to learners in welding and metal fabrications, still which cannot produce individuals who can function productively in a highly competitive market economy. It is as a result of this insight that I intended to approach you as key primary stake holders of VET institutions so that we together can find out ways through which we can reposition welding and metal fabrications. Your responses to the questions below are very important and it will be treated with due confidentiality it deserves.

Consent

I am willing to participate in this study and my views can be used for the purpose of this research without any further consultations.

Tick the appropriate choice: Yes No

Identification Information

1. Name.....Signature.....
.....
2. What course are you doing?
.....

Interview questions

3. Why did you apply for the course?

.....

4. What were your expectation when you were admitted for this course?

.....

...

5. How has the study program been carried out?

.....

...

6. What challenges do you face during studying this course?

.....

7. What can be done to improve on the challenges?

.....

B. Interview Guide for Instructors

Introduction

I am Elaru Patrick, a student at Kyambogo University pursuing a Master's Degree in Vocational Pedagogy. I am carrying out an action research which is a requirement for fulfilment for the award of MVP. Through my experiences as a teacher and now with the knowledge I have attained during my study as a MVP student, I have come to realize that despite the existing training processes delivered to learners in welding and metal fabrications, still which cannot produce individuals who can function productively in a highly competitive market economy.

It is as a result of this insight that I intended to approach you as practitioners and trainers of VET institutions so that we together can find out ways through which we can reposition welding and metal fabrications at BTI. Your responses to the questions below are very important and it will be treated with due confidentiality it deserves.

Consent

I am willing to participate in this study and my views can be used for the purpose of this research without any further consultations.

Tick the appropriate choice: Yes No

Identification Information

1. Name.....Signature.....

.....

2. What course are you doing?

.....

Interview questions

1. For how long have you been in this profession?

2. What activities do you engage in to ensure your professional development?

.....

3. What is the attitude of the community towards welding as a trade or field of study?

.....

4. How does this community attitude impact on your practice as a facilitator of learning in your field of study?

5. How do you rate the curricula that you follow in your teaching? Please give reasons for your response.....

6. How does the scenario you have mentioned above influence your professional practice as a teacher of welding?

.....

7. What are the instructing strategies employed in the instruction of welding and metal fabrications at BTI?

8. How effective are the instructing strategies employed by instructors in the instruction of welding and metal fabrications at BTI?

.....

9. What are the most effective preferred strategies instructors employ in instructions at BTI?

.....

.....

Appendix 4: A Future Workshop Guide

Future workshop carried out at BTI on 7th February, 2018:

A future workshop is a problem identification tool in any given setting aimed at collaboratively generate workable solutions within the work place. The future workshop has procedures to be followed, thus involves four phases in which a critical question is posed to the participants for discussion during the critique phase.

The Four phases of the future workshop include Preparations phase, Critique phase, Fantasy phase and Reality Phase. The specific activities undertaken in each of the future workshop phases are explained in the following sections.

1. Preparation phase:

- Setting date, venue and informing participants
- Organizing refreshments, scholastic materials and set the Agenda to guide the process:

Agenda

- i. Opening prayers
- ii. Self-introduction by the participants
- iii. Communication by researcher on: brief explanation on A/R, F/W method and set ground rules or guiding principles for the discussion.
- iv. Future workshop procedures carried out
- v. closure

2. Critique phase:

Set a critical question for in depth discussion.

What brings about poor skills acquisition by trainees in welding and metal fabrications at BTI?

3. Fantasy phase:

Turning all the negative ideas identified into positives, every situation assumed to be possible, resources available to fix every problem,

4. Reality phase:

- The ideal situation to take on short term challenges which have to be subjected to pairwise matrix ranking or through voting to get the most pressing challenge responsible for poor trainees' skills acquisition.
- The challenges identified with highest tally takes to be the research problem.
- Participants agree on research topic out of the identified most pressing challenge.
- Participants agree on action implementation strategies

Appendix 5: Focus Group Discussion Guide

1. Are your expectations being met during the course of your study? If not what do you think should be done?
2. What problems do you encounter in the delivery of practical?
3. Do you think the skills being taught are relevant to the world of work?
4. What comments do you have on the resources used in teaching /learning process?
materials, tools, etc.?
5. What do you think should be done to improve the teaching and learning process?
6. How do you assess competence of learners?
7. What are the challenges faced during assessment?
8. What are your comments on the methods used in assessment?
9. What do you think should be done to improve on the methods used in assessment?
10. What do you think can be done in order to produce competent trainee?

THANK YOU

Appendix 6: Pairwise Matrix Ranking Tool

Table 1. Pairwise Ranking

	Inadequate training	Poor instruction	Poor sanitation	Delayed purchase of instruct	Poor administrat	Poor time mg't	Tally	Rank
S/N	1	2	3	4	5	6		
1								
2								
3								
4								
5								
6								

Appendix 7: Implementation Plan

Table 1. Implementation plan for Administration

Activity	Responsible Personnel/Participants	Indicators	Period
Preparations for PBL (provide resources e.g. room, stationary, materials refreshments)	Principal, Head of department, Researcher	• Availability of a room, • Requisitions of materials and Stationary.	28 th – 31 st May, 2018
Implementation plan for improving Project Based Learning.	Administrators, Instructors, Researcher, trainees	• Attendance list, photos • Implementation plan in place. • Real life assessment tool	19/06/2018 22/06/2018 25/06/2018
To monitor implementation of Project Based Learning on real life project	Head of department, Instructors, Researcher	• Attendance sheet. • Record of assessment.	June, 2018 – August, 2018
To make an evaluation on impact of PBL.	Head of department, Instructors, Researcher, trainees	• Minutes • Attendance list • Photos	27/07/2018

Implementation plan for instructors

Activity	Responsible personnel/Participants	Indicators	Period
To mobilize trainees	Head of department, Instructors, Class coordinator.	• Notices • Records of attendance	19/06/2018 22/06/2018 25/06/2018
To instruct trainees following the PBL on real life project	Principal Head of department Instructors	• Records of attendance • Photos of participants	June, 2018 – August, 2018
To evaluate the Project based learning	Head of department, Instructors, trainees, Researcher, Supervisor	• Minutes of the meeting • Records of the attendance • photos	27/07/2018

Implementation plan for trainees

Activity	Responsible personnel/participants	Indicators	Period
To keep class room/workshop clean	Trainees	-Clean environment -Sweeping roster	May, 2018 - August, 2018
To attend instructions for skills enhancement (real life project)	Trainees, Instructors, Researcher	-Records of attendance. -Records of marks on real-life project	June, 2018 – August, 2018
To evaluate the impact of Project Based Learning employed	Head of department, Instructors, trainees, Researcher	- minutes of the meeting -Records of attendance	27/07/2018

Appendix 8: Buhimba Technical Institute Assessment Tool for Real Life Project

Table 1. Performance Assessment

	PERFORMANCE ASSESSMENT
Occupational Title	Welder / Metal Fabricator
Competence Level	Level 1
Practical Item	Welding table (4 items per group)
Date of start of Real Life Project	25 th July, 2018
Related skills of knowledge	Knowledge of material selection, interpreting sketches and drawings, welding types and positions, skills of marking, measuring, cutting and straightening
Required tools, equipment and materials	MIG Welding machine, welding mask, grinder, hack saw, hammer, square, vice, chisel, shelter, materials like angle bars, hollow section, steel plate
Time frame/Time allocated	July, 2018 – Aug, 2018
Place of work	BTI - Welding workshop
Remarks by Trainer	

Table 2. Assessment Criteria

S/N	ASSESSMENT CRITERIA	SCORING GUIDE	Process	Product	Names / Reg. Nos. (Group.....)						
					01	02	03	04	05	06	07
01	Prepared materials	Clean work place	1								
		Cleaning rags put in place	1								
		Work drawing prepared	2	2							
		Interpreted and transfer measurements to work pieces	2	2							
		Identified correct tools		2							
		Observe safety	2	2							
02	Cutting of materials	Measure work pieces	2								
		Cut pieces with hacksaw and chisel	2	2							
03	Setting welding machine	Regulating speed and current	2	2							
04	Spot weld	Apply square in the corners of frame and tack weld joints	2	2							
		Using square / tape measure cross check dimensions	2								
05	Full Welding of the joints	Apply full weld at all joints	2	2							
		Weld is continuous	2	2							
		Weld is uniform	2	2							
		Welding is smooth		2							
		Weld has no cracks		2							
		Weld has good penetration		2							
06	Finishing the work	File / grind the product	2	2							
		Sand papering the product	2								
		Free of spatter		2							
07	Clean the work area after work	Clean tools		1							
		Clean work area		1							
	Total score		28	32							
	Percentage		100%								

Name of Assessor:

Signature & Date:

Approved by HOD: Name

Course coordinator's Name:

Signature & Date:

Signature & Date:

Appendix 9: Workshop Machines

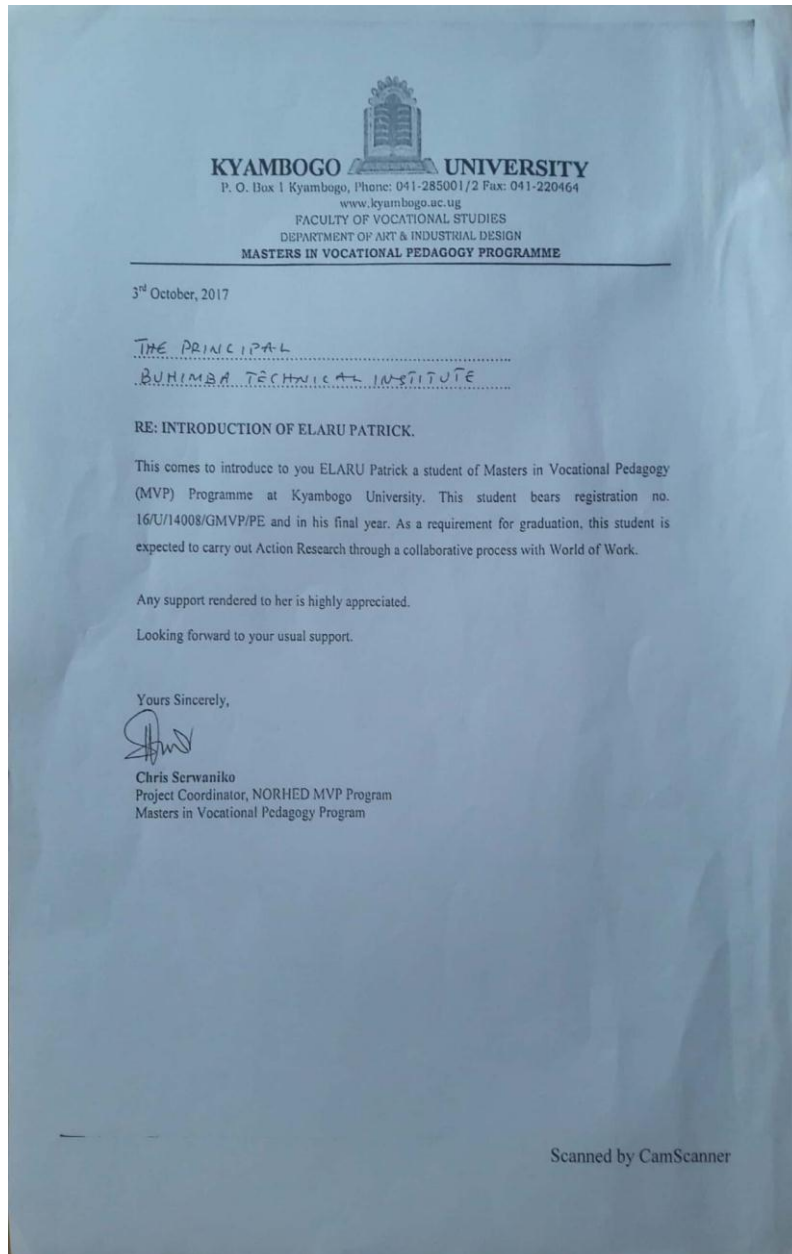


Figure 1. Magnaflux: Weld testing machine



Figure 1. Sheet rolling machine

Appendix 10: Introductory, Request, and Invitation Letters



BUHIMBA TECHNICAL INSTITUTE

P.O. BOX 287, HOIMA.

Date: 18th October, 2017

The Principal
Buhimba Technical Institute

Dear Sir,

**RE: REQUEST TO CONDUCT AN ACTION RESEARCH AT BUHIMBA TECHNICAL
INSTITUTE:**

I humbly submit to your office the aforementioned subject matter.

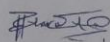
The Action Research that will be conducted is aimed at informing and improving the teaching learning processes within the institute and its part of the requirement for the fulfilment of my successful completion of Masters in Vocational Pedagogy offered at Kyambogo University. This will involve the engagement of primary stake holders and other staff of the institute.

By copy of this communication, am kindly requesting the staff and students of Buhimba Technical Institute to willingly participate actively and freely avail the necessary information during the research process.

The researcher also promises to keep the identities and any related matter of the participants confidential unless permission is sought from them for publicity.

Your active participation in this research will be highly appreciated.

Yours faithfully,


Elaru Patrick

Copy:

Chairperson Board of Governors

Staff Notice Board.

Students' Notice Board

Personal File



BUHIMBA TECHNICAL INSTITUTE

P.O.BOX 287, HOIMA
TEL: 0779441696
EMAIL: buhimbat@gmail.com



OFFICE OF THE PRINCIPAL

Our Ref:

23/10/2017

Your Ref:

TO MR. ELARU PATRICK
DEPUTY PRINCIPAL (RESEARCHER)
BUHIMBA TECHNICAL INSTITUTE

Dear Sir,

RE: REQUEST TO CONDUCT AN ACTION RESEARCH AT BUHIMBA TECHNICAL INSTITUTE:

In reference to your letter dated 18/10/2017, you have been given chance to conduct your study research in the department you have preferred. I am requesting you to liaise with the Head of Department who shall receive a copy of this letter so that you don't overlap in the department activities.

I wish you the best of luck as you perform your duties.

Yours faithfully,

AKOKI ANYAMO
PRINCIPAL

: Head of Department – Welding

Cc : File



06th/02/2018

Our Ref:

Your Ref:

THE PRINCIPAL,
BUHIMBA TECHNICAL INSTITUTE,
P.O BOX 287,
HOIMA.

Dear Sir,

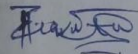
RE: INVITATION TO ATTEND A FUTURE WORKSHOP

I hereby write to invite you to attend a future workshop scheduled for 7th February, 2018 at Buhimba Technical Institute conference room starting at 9:00am.

The purpose of this workshop is to satisfy the requirements for carrying out an Action Research in improving the teaching methodologies in Welding and Metal Fabrication in which is to be subjected to an in-depth inquiry for establishing gaps and collaboratively determine appropriate intervention for the improvement in the instructions of Welding and Metal Fabrication course.

I would be grateful for your participation in this workshop since you are key stake holders at Buhimba Technical Institute.

Yours faithfully,



ELARU PATRICK

16/V/14008/GMVP/PE

STUDENT- MASTERS OF VOCATIONAL PEDAGOGY OF KYAMBOGO UNIVERSITY

Our Ref:

06th/02/2018

Your Ref:

THE ACADEMIC REGISTRAR,
BUHIMBA TECHNICAL INSTITUTE,
P.O BOX 287,
HOIMA.

Dear Sir,

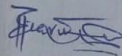
RE: INVITATION TO ATTEND A FUTURE WORKSHOP

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I would be grateful for your participation in this workshop since you are key stake holders at Buhimba Technical Institute.

Yours faithfully,



ELARU PATRICK

16/V/14008/GMVP/PI

STUDENT- MASTERS OF VOCATIONAL PEDAGOGY OF KYAMBOGO UNIVERSITY

Our Ref:

Your Ref:

06th/02/2018

THE INSTITUTE BURSAR,
BUHIMBA TECHNICAL INSTITUTE,
P.O BOX 287,
HOIMA.

Dear Madam,

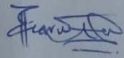
RE: INVITATION TO ATTEND A FUTURE WORKSHOP

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The purpose of this workshop is to satisfy the requirements for carrying out an Action Research in improving the teaching methodologies in Welding and Metal Fabrication in which is to be subjected to an in-depth inquiry for establishing gaps and collaboratively determine appropriate intervention for the improvement in the instructions of Welding and Metal Fabrication course.

I would be grateful for your participation in this workshop since you are key stake holders at Buhimba Technical Institute.

Yours faithfully,



ELARU PATRICK

16/V/14008/GMVP/PE

STUDENT- MASTERS OF VOCATIONAL PEDAGOGY OF KYAMBOGO UNIVERSITY

Our Ref:

06th/02/2018

Your Ref:

THE INSTRUCTOR- WELDING,
BUHIMBA TECHNICAL INSTITUTE,
P.O BOX 287,
HOIMA.

Dear Sir,

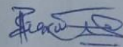
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I would be grateful for your participation in this workshop since you are key stake holders at Buhimba Technical Institute.

Yours faithfully,



ELARU PATRICK

16/V/14008/GMVP/PE

STUDENT- MASTERS OF VOCATIONAL PEDAGOGY OF KYAMBOGO UNIVERSITY

Our Ref:

06th/02/2018

Your Ref:

TRAINEES WELDING AND METAL FABRICATION,
BUHIMBA TECHNICAL INSTITUTE,
P.O BOX 287,
HOIMA.

Dear Trainees,

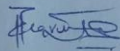
RE: INVITATION TO ATTEND A FUTURE WORKSHOP

I hereby write to invite you to attend a future workshop scheduled for 7th February, 2018 at Buhimba Technical Institute conference room starting at 9:00am.

The purpose of this workshop is to satisfy the requirements for carrying out an Action Research in improving the teaching methodologies in Welding and Metal Fabrication in which is to be subjected to an in-depth inquiry for establishing gaps and collaboratively determine appropriate intervention for the improvement in the instructions of Welding and Metal Fabrication course.

I would be grateful for your participation in this workshop since you are key stake holders at Buhimba Technical Institute.

Yours faithfully,



ELARU PATRICK
16/V/14008/GMVP/PE
STUDENT- MASTERS OF VOCATIONAL PEDAGOGY OF KYAMBOGO UNIVERSITY

Appendix 11: Minutes of Meetings

BUHIMBA TECHNICAL INSTITUTE P.O BOX 287, HOIMA.

MINUTES FOR FUTURE WORKSHOP HELD ON 7TH/FEB/2018 AT THE INSTITUTE BOARD ROOM

AGENDA

1. Opening prayer
2. Self-introduction
3. Communication from Researcher
4. Future workshop procedures
5. Closure

Members present

S/N	NAME	SEX	TITLE/COURSE	TEL.CONTACT
1.	OKENG RICHARD	M	REGISTRAR	0782755766
2.	NSEREKO ELVIS	M	NCWF	0785838201
3.	BAGUMA HERBERT	M	NCWF	0770583311
4.	KAMURUNGI JOAKIM	M	NCWF	0773378052
5.	KAZOORA RONALD	M	NCWF	0788363882
6.	KUSEMERERWA BRIAN	M	NCWF	0771472064
7.	KYALISIIMA RUTH	F	BUILDING	0788419133
8.	BARONGO MICHEAL	M	BUILDING	0780517080
9.	MURUNGI CLAIRE	F	BUILDING	0775644375
10.	TALEMWA ALLAN	M	NCWF	0786820340
11.	UCHOKURU JOHN MARY	M	NCWF	0782785370
12.	MURUNGI JOAKIM	M	NCWF	0701370891
13.	NATUKUNDA WILLIAM	M	NCWF	0706335261
14.	ESONG DANIEL	M	INSTRUCTOR	0773233153
15.	ASSAJA JOHN ABRAHAM	M	MVP	0782050657
16.	ELARU PATRICK	M	D/PRINCIPAL/RESEARCHER	0772302675
17.	KYAKULUMBYE ALI KATENDE	M	MENTOR/SUPERVISOR	

MIN 01/02/2018: OPENING PRAYER

The workshop was opened with an opening prayer from one of the participants.

MIN 02/02/2018: SELF-INTRODUCTION

The self-introduction was done by all the participants present.

MIN 03/02/2018: COMMUNICATION FROM THE RESEARCHER

The researcher thanked the participants for honoring the invitation.

He described Action Research as a means of identifying problems and giving solutions to those problems.

He also said that the future workshop is aimed at solving problems affecting the participants in their departments.

The researcher stressed the importance of the Action Research as; a means of helping the teachers to build their capacity.

The ground rules for the workshop were;

1. Generate ideas within a short time.
2. No criticism among participants.
3. Transparency
4. Respect for one another.
5. Democratic process.

Finally the researcher thanked/appreciated the participants for turning up for the invitation.

MIN 04/02/2018: FUTURE WORKSHOP PROCEDURES.

The first stage is the challenges the second stage is getting solutions and thirdly the implementation.

The Researcher requested the participants to point out the challenges faced in Welding Department while acquiring knowledge and skills.

In response the participants pointed out the following challenges.

- (a) Inadequate tools and materials/equipments
- (b) Poor communication
- (c) Inadequate supply of power.
- (d) Poor administration.
- (e) Few Instructors.
- (f) Poor accommodation
- (g) Poor storage of equipments.
- (h) Poorly stocked library
- (i) Noise/Non conducive environment.
- (j) Poor welfare.
- (k) Poor Management.
- (l) Poor medical services.
- (m) Need for refresher courses.

The challenges identified were clustered/categorized as short term, medium term and long term.

1. Short term challenges were;
 - Inadequate training materials
 - Poor administration/poor communication.
 - Poor handling of tools and materials.
 - Inadequate tools and equipments in workshops.
 - Poor instructional methods.
 - Poor time management.
2. Medium term challenges were;
 - Inadequate power supply.
 - Few instructors.
 - Poor storage of tools and equipments.
 - Need for refresher courses.
 - Poor welfare.
3. Long term challenges.
 - Poorly stocked library.
 - Noise pollution from workshops
 - Poor accommodation
 - Lack of computers.

After identifying and clustering, the challenges were paired and ranked using PAIRWISE MATRIX RANKING to get the most serious challenge which had the highest frequency.

Challenge "Improving instructional method to enhance skills acquisition at Buhimba Technical Institute which is located in Hoima District."

MIN 05/02/2018: CLOSURE

The researcher in his conclusion appreciated the participants for coming to the workshop.

He also welcomed the reactions from instructors and trainees.

One of the instructors Mr. Okeng Richard reacted to the participants by emphasizing the trainees to consider their instructors as important people if the trainees are to acquire skills.

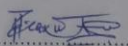
Finally Mr. Okeng Richard thanked the participants for the time they sacrificed to attend the future workshop.

The meeting was closed with a word of prayer from a female participant at 1:45pm.

Recorded by,

Approved by,


.....
ESONG DANIEL
MINUTE SECRETARY


.....
ELARU PATRICK
RESEARCHER

**ACTION RESEARCH MEETING HELD ON 27/7/2018 AT BUHIMBA
TECHNICAL INSTITUTE**

Agenda

1. Opening prayer
2. Self-introduction
3. Opening remarks from researcher
4. Remarks from supervisors
5. Brief discussion between supervisor and members
6. Reactions
7. Way forward
8. Closing remarks from administrator
9. Closure

(ATTENDANCE LIST ATTACHED)

MIN.01/07/2018: OPENING PRAYER

This was said by Ejulan Jorem. He called upon God's guidance and wisdom during the meeting.

MIN.02/07/2018: SELF-INTRODUCTION

It was self-introduction

MIN.03/07/2018: OPENING REMARKS FROM RESEARCHER

He thanked members for their co-operation which was evidenced by the attendance.

He welcomed the supervisor and thanked her for endurance amidst transport challenges.

MIN.04/07/2018: REMARKS FROM SUPERVISOR

She thanked members for their time offered to attend the meeting.

Introduced herself as a lecturer Kyambogo University, a mechanical engineer, Dr. Catherine Wandera by names.

MIN.05/07/2018: BRIEF DISCUSSION BETWEEN SUPERVISOR AND MEMBERS PRESENT.

- She began by asking challenges experienced by students during their training.
- She also asked how the training was being conducted and what each one could do.
- She asked on the process before Welding and challenges.
- She asked on the Welding tools and equipment required during welding.

- Asked the types of joints when welding, and different welding positions.
- Encouraged learners to search for information through yahoo, u-tube, library etc.
- She asked the learners the difference between aluminium and steel as being the common metals used in the welding workshops.
- She asked the instructors on how to improve the delivery of training. I.e. tools required.

MIN.06/07/2018: WAY FORWARD

She requested the administration for enough time and materials to effect the training.
Create means of improving more on skills.

MIN.07/07/2018: CLOSING REMARKS FROM BTI ADMINISTRATORS

The administrator, Mr. Okeng Richard thanked the supervisor and all members who had turned up for the workshop.

Pledged to take into considerations what was raised as concerns.

Concluded by wishing the supervisor safe journey back to Kampala and encouraged her to keep visiting the institution.

MIN.08/07/2018: CLOSURE

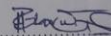
This was from the researcher, who once again thanked members and the supervisor for their time.
Promised to capture all what was discussed in his research report for the betterment of skills acquisition.

Recorded by,



Ejulan Jorem
Minute Secretary

Approved by,



Elaru Patrick
Chairperson

Appendix 12: Attendance Lists

KYAMBONGO UNIVERSITY

Attendance Sheet

Name of activity: Action Research - Directed Vocational Studies Date: 23/10/2017

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name or participant	Course/ Title	telephone contact	m	f	signature
1	Kawemba Geoffrey	NCWF	0789204236	M		
2	Pyabaswa Rogers	NCWF	077581842	M		
3	Ngonzebwa Moses	NCWF	0772360127	M		
4	KAAHWA AMOS	NCWF	0771995574	M		
5	MONDAY BOAZ	NCWF	0754256213	M		
6	MURUNGI JOACHIM	NCWF	0777058637	M		
7	TALEMWA ALLAN	NCWF	0786820390	M		
8	EYOTRE JOHN KENNETH	NCWF	0786518865	M		
9	ATULINDA DICKENS	NCWF	0780250439	M		
10	MHAISE ASIMUVE	NCWF	0773805356	M		
11	NAYAMBA PATIA	NCWF	0774086530	F		
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Researcher's Name: Elaru Patrick Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop

Date: 7/02/2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	Okeng Richard	Registrar	0782755766	M	Okeng
2	NGERELO ELVIS	NCWF	0785888201	M	NGERELO
3	BAGUMA HABERT	NCWF	0770583311	M	BAGUMA
4	KAMBERUNG JOAKIM	NCWF	0773378052	M	KAMBERUNG
5	KAZOORA RONALD	NCWF	0788363882	M	KAZOORA
6	KULIMBERWA BRIAN	NCWF	0771472064	M	KULIMBERWA
7	KYRUSLIMA RUTH	BTC	0788411133	F	KYRUSLIMA
8	BARONCO MICHAEL	BUILDING	0780517080	M	BARONCO
9	MURUGI CLARE ETHEL	BUILDING	0776644373	F	MURUGI
10	TALEMWA ALLAN	NCWF	0786820340	M	TALEMWA
11	UCHOKURU JOHAS MARY	NCWF	0782785370	M	UCHOKURU
12	MURUGI JOACHIM	NCWF	0701370891	M	MURUGI
13	NATUKUNDA WILLIAM	NCWF	0706335261	M	NATUKUNDA
14	ESONG DANIEL	BUILDING	0773233153	M	ESONG
15	ASSAJA JOHN ABRAHAM	NYP	0782-050657	M	ASSAJA
16	ELARU PATRICK	PRINCIPAL	0772302675	M	ELARU
17	KYALULUMBE ALI	LECTURER - KYU	0772619576	M	KYALULUMBE

Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop

Date: 7/02/2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	Odongo Geoffrey	Instructor welder	0701759341	MALE	Odongo
2	Eperu Julius Peter	Instructor welder	0777770186	MALE	Eperu
3					
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Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - ^{IMPLEMENTATION} ~~Future-Workshop~~

Date: 25-06-2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	TUHALSE ACUMWE	NCKIF	0793806256	Male	
2	NATAMBA FATIA	NCKIF	0774763244	F	
3	NATUKUNDA WILLIAM	NCWF	0706325261	M	
4	TALEMWA ALAN	NCWF	0786820340	M	
5	MONDAY BOAZ	NCWF	0754286213	M	
6	KOBULINGE FLAVIA	NCWF	0789674019	F	
7	KATHWA AMOS	NCWF	0771995574	M	
8	BIHANSWA JIA ROGERS	NCWF	0775818542	M	
9	NGONZIRWA MOSES	NCKIF	077736027	M	
10	ETOTRE JOHN KENNETH	NCKIF	0781106159	M	
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Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop

Date: 29/06/2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	NATUKUNDA WILKIAM	NCWF	0706335261	M	
2	MONDAY BOAZ	NCWF	0754286213	M	
3	BYABUSHA ROGERS	NCWF	0755818842	M	
4	TALIMWA ALLAN	NCWF	0786820340	M	
5	KAAHWA AMOS	NCWF	0771995574	M	
6	TUHAISE ASIMWE	NCWF	0773806256	M	
7	KOBUSINGE FLAVIA	NCWF	0759674019	F	
8	NAYAMBA FATIA	NCWF	0774763344	F	
9	NGONZEBWA MOSES	NCWF	0777360127	M	
10	EYOTRE JOHN KENNETH	NCWF	0781105189	M	
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Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop

Date: 05/07/2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	NGONZEBWA MOSES	NCWF	0777360127	M	
2	NAYAMBA FATIA	NCWF	0774763344	F	
3	NATUKUNDA WILKIAM	NCWF	0706335261	M	
4	EYOTRE JOHN KENNETH	NCWF	0781105189	M	
5	KOBUSINGE FLAVIA	NCWF	0759674019	F	
6	MONDAY BOAZ	NCWF	0754286213	M	
7	KAAHWA AMOS	NCWF	0771995574	M	
8	TALIMWA ALLAN	NCWF	0786820340	M	
9	TUHAISE ASIMWE	NCWF	0773806256	M	
10	BYABUSHA ROGERS	NCWF	0755818842	M	
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Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop ^(EVALUATION)_{MEETING} Date: 27-07-2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	Okeng Richard	Registrar	0782755766	M	Okeng
2	RYARU HANGA WILLIAM	Asst. Instructor	0787243720	M	Okeng
3	NAYAMBA FAHA	NCKF II Student	0774763344	F	Okeng
4	KOBULINGE FLAVIA	STUDENT I	0789674019	F	Okeng
5	ADABO JESCA MORENCE	STUDENT I	0777781856	F	Okeng
6	WEMBATBARI ALICE VIELLA	STUDENT NCWF I	0777210337	F	Okeng
7	NGONZERWA MOSES	STUDENT NCWF II	0773360127	M	Okeng
8	KALUMBA GEOFFREY	STUDENT NCWF II	0780208600	M	Okeng
9	BYAMUKWIZA ROBERT	NCWF II Student	0775518842	M	Okeng
10	NASSALI NOELINE	STUDENT I	0750866836	F	Okeng
11	KAAHWIA AMOS	STUDENT II	0771995574	M	Okeng
12	TAFEMWA ALLAN	STUDENT II	0786820340	M	Okeng
13	MATUKUUBA WILLIAM	STUDENT II	0706335261	M	Okeng
14	BARUGAHARA JOSEPH	STUDENT I	0785979816	M	Okeng
15	MUNESIGWA KILUSIFF	STUDENT	0773417059	M	Okeng
16	MONDAY BOAZ	STUDENT II	0754286213	M	Okeng
17	EPERU JULIUS PETER	Asst INSTRUCTOR	0777778186	M	Okeng
18	Ejulan Jarem	Asst. instructor	0781255046	M	Okeng

Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

ATTENDANCE SHEET

Name of activity: Action Research - Future Workshop (EVALUATION MEETING) Date: 27-07-2018

Location/ Department: Welding and Metal Fabrications - Buhimba Technical Institute, Hoima District

S/N	Name of participant	Course/ Title	Telephone contact	Sex	Signature
1	ELARU PATRICK	RESEARCHER	0772302675	M	<i>Elaru Patrick</i>
2	CATHERINE WANDERA	SUPERVISOR/Dr	0704028822	F	<i>Catherine Wandera</i>
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Researcher's Name: Elaru Patrick - Kyambogo University

Telephone contact: 0772302675 / 0750884673

BUHIMBA TECH INSTITUTE
TERM TWO-2018

WORKSHOP CLEANING ROTA FOR
WELDING AND METAL FABRICATION 2018
1st WEEK

- 1 NAGANDA WILLIAM
- 2 NATAMBA FAHA
- 3 MURUNGI JOACHIM
- 4 MONDAY BOAZ
- 5 NGONZEBWA MOSES
- 6 TOHAISE ASIMWE

2nd WEEK

- 1 KAWEMBA GEOFFREY
- 2 ETOIRE JOHN KENNETH
- 3 KOBUSINGE FLAVIA
- 4 KAHWA AMOS
- 5 BYABASAJA ROGERS
- 6 ETOIRE JOHN TALEMKA ALLAN

3rd WEEK

- 1 KEMBABAZI ALICE STELLA
- 2 BARUGAHARA JOSEPH
- 3 KYAMANYWA VICENT
- 4 ADWA WILBERFORCE OFWONO
- 5 MURUNGI WILLIAM
- 6 MWESIGWA WYCLIFF

4th WEEK

- 1 NASSALI NOELINE
- 2 MUKWEZI GIDEON
- 3 KAMWAKA GABRIEL
- 4 BACUMA EMMANUEL
- 5 MBABAZI ROGER
- 6 TWINOMUGIRA ISAAC

5th week

- 1 ADABO JESSA FLORENCE
- 2 MUABE TONY
- 3 ATEGEKA STUART
- 4 NAMANYA JONAH GENIEK
- 5 AHOMUA JONAH

Appendix 13: Supervision Form

KYAMBOGO UNIVERSITY
P. O. Box 1 Kyambogo, Phone: 041-285001/2 Fax: 041-220464
www.kyambogo.ac.ug
FACULTY OF VOCATIONAL STUDIES
Masters in Vocational Pedagogy Programme

RESEARCH SUPERVISION TEMPLATE

Date: 07/02/2018

Candidate Information

Student Name:	<u>ELARU PATRICK</u>
Reg. No.	<u>1610/14008/AMVP/PE</u>
Phone No.(s)	<u>0772302675 / 0750884673</u>
Email:	<u>elarub2@gmail.com</u>

Workplace/Institutional Supervisor's contact details

Name:	<u>AKOKI ANYAMO</u>	Phone no.	<u>0779441696</u>
Email Address:	<u>akokianyam@gmail.com</u>		

Mentor's contact details

Name:	<u>KYAKULUMBE ALI</u>	Phone no.	<u>0701617576</u>
Email Address:	<u>kyakulumbeyali@gmail.com</u>		

Venue for meeting BUMBA TI.....Scheduled time of meeting 10:00 AM.....

Research Area under discussion (Topic of focus)
IMPROVING INSTRUCTIONAL METHODS TO ENHANCE TRAINEES SKILLS ACQUISITION IN WEAVING AND MESH FABRICATIONS

Progress from previous discussion
Future workshop was held on 7th 12/2018 addressing the sub-phase fantasy and reality phase. This was done and GC completed with the presence of the mentor Mr. Kyakulumbeyali.

Way forward
The participants during the future workshop agreed on the area research study and the topic was developed as improving instructional methods to enhance skills acquisition by the trainees.

Date for next meeting: 7/3/18

Name of Supervisor a).....Signature:.....
b).....Signature:.....
Name of Mentor/s a) KYAKULUMBE ALI.....Signature: KAL
b).....Signature:.....
Student's Signatures: Elaru Patrick

KYAMBOGO UNIVERSITY

P. O. Box 1 Kyambogo, Phone: 041-285001/2 Fax: 041-220464
www.kyambogo.ac.ug

FACULTY OF VOCATIONAL STUDIES
Masters in Vocational Pedagogy Programme

RESEARCH SUPERVISION TEMPLATE

Date: 27/07/2018

Candidate Information

Student Name:	ELARU PATRICK
Reg. No.	16/U/14008/GMVP/PE
Phone No(s)	0772302675 / 0750884673
Email:	elaru63@gmail.com

Workplace/Institutional Supervisor's contact details

Name:	AKOKI ANYAMO	Phone no.	0779441696
Email Address:	akokianyamo@gmail.com		

Mentor's contact details

Name:		Phone no.	
Email Address:			

Venue for meeting: BUTIMBA TECHNICAL INSTITUTE, HOMBA Scheduled time of meeting: 12:30

Research Area under discussion (Topic of focus)

IMPROVING INSTRUCTION METHOD FOR ENHANCEMENT OF TRAINEES SKILLS ACQUISITION IN WELDING AND METAL FABRICATION AT BUTIMBA TECHNICAL INSTITUTE HOMBA

Progress from previous discussion

Mentioning how instructors are delivering training. Currently observations made include: old teaching method in use, instructors engaged in active training but lack resources for delivering the training.

Way forward

The candidate to suggest interventions that will improve the delivery of training.

Date for next meeting:

Name of Supervisor a) CATHERINE WANBERA Signature: [Signature]
b) Signature:
Name of Mentor/s a) Signature:
b) Signature:
Student's Signatures: ELARU PATRICK [Signature]

RESEARCH SUPERVISION TEMPLATE

Date: 22/03/2018

Candidate Information

Student Name:	ELARU PATAICK
Reg. No.	1610114008/GHVP/PS
Phone No.(s)	0772302675 / 0750884673
Email:	elaru63@gmail.com

Workplace/Institutional Supervisor's contact details

Name:	AKOBI AMYAMO	Phone no.	0779441696
Email Address:	akobiamyamo@gmail.com		

Mentor's contact details

Name:		Phone no.	
Email Address:			

Venue for meeting: BUSHIMBA TECHNICAL INSTITUTE Scheduled time of meeting: 12:45pm

Research Area under discussion (Topic of focus)

IMPROVING INSTRUCTIONAL MATERIAL TO ENHANCE TRAINEES' SKILLS ACQUISITION IN WELDING AND METAL FABRICATION AT BUSHIMBA TECHNICAL INSTITUTE - HOIMA

Progress from previous discussion

Implementation stage after the intervention was going well and the report was presented

Way forward

To do the correction concerning the issues raised during the presentation this has been done

Date for next meeting:

Name of Supervisor a) Dr. Peter L. Dyer Signature: [Signature]
 b) Name of Mentor/s a) Signature: [Signature]
 b) Signature: [Signature]
 Student's Signatures: ELARU PATAICK [Signature]