DIGITAL KNOWLEDGE PACK INTEGRATION INTO FIELD ATTACHMENT PROGRAMME AND ITS EFFECT ON FARM EXPERIENTIAL LEARNING AMONG EGERTON UNIVERSITY STUDENTS, KENYA

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A Thesis Submitted to the Graduate School in Partial Fulfilment of the Requirements for the Doctor of Philosophy Degree in Agricultural Rural Innovation Studies of Egerton University

EGERTON UNIVERSITY

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DECLARATION AND RECOMMENDATION

Declaration

This is my original work and has not been previously submitted or published for the award of a degree in this or any other university.

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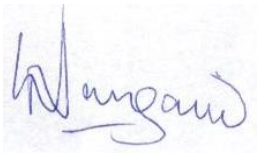

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DEDICATION

To my husband, Chege Kamau and our children Waceke, Kamau, Kariuki, Wambui, and Bochaberi, my late dad, John Kariuki and my mother Beatrice Wambui. To all University students who choose farm attachment programme in support of farmers.

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ABSTRACT

Globally, universities are under pressure to produce competent professionals. Experiential Learning (EL) approach has demonstrated the potential to contribute to development of such capabilities. However, EL does not just happen; it requires high prior knowledge in the technical area and students' possession of Experiential Learning Abilities (ELAs) to enhance learning from experiences. Despite Egerton University's (EU) efforts to provide EL through its Farm Attachment Programme (FAP), no adequate quantification of students' ELAs has been conducted for improvement purposes. This study aimed at integrating a Digital Knowledge Pack (DKP) Innovation into FAP and evaluating its effects on students ELAs among Egerton University students. The innovation was characterized by: DKP weekly structure (DWS), DKP students' portfolio (DSP), DKP implementation enablement (DIM) and DKP Resources (DR). Participatory Action Research design targeting six hundred students and their host farmers was employed. Systematic random sampling technique was used to select 102 students for the baseline survey (2016, 2017 and 2018 cohorts). Piloting was conducted among twenty (20) students in Rongai ward and a Cronbach's alpha reliability coefficient of r = .80 obtained. Thirty (30) students (2019 cohort) participated in the action phase conducted in Njoro ward of Nakuru county. The students were allowed to proceed for FAP in the first three weeks and DKP innovation introduced in the fourth week of FAP. Evaluation of the DKP integration into FAP followed after completion. Google group observation proforma, focus group discussion topic guide, semi structured baseline questionnaire and DKP evaluation questionnaires, used to collect data were validated by Experts from Egerton University. The findings showed that, FAP was characterized by: students', host farmers' and FAP structure and implementation attributes and the overall ELA level was low (M=2.79, SD=0.51). Students' Prior knowledge in agriculture, students' gender, students' academic departments, host farmer's level of income and FAP structure and implementation attributes were found to affect ELAs. Further, integration of DKP into Fap was found to improve ELA levels (M=4.04, SD = 0.68). A Multiple Linear Regression (MLR) was run which also included Variance Inflation Factor (VIF) in the output. Multicollinearity of some DKP innovation attributes was found. A Principal Component Analysis (PCA) was run in SPSS to resolve the issue and one component [DKP Innovation Design (DID) attribute] solution found. Integrating DKP into FAP improved ELA index by 1.356 at 95% confidence level [1.005, 1.706; t (29) = -7.900, $p \leq .0001$)]. GLR model predicting ELAs ($_{\text{after DKP}}$) from DID attribute, was highly significant [F (4,25) =69.261), p = .0001)]. In conclusion, the study showed that integrating DKP into Farm attachment programme improved Students' ELAs Significantly. There need therefore for universities and other tertiary institutions to adopt the DKP innovation integration during students 'practicum programmes to improve

Experiential learning.

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LIST OF ABBREVIATIONS AND ACRONYMS

A*i*	Analysis Index
ANOVA	Analysis of Variance
BUGS	Board of Undergraduate Studies
Ca*i*	Continuity Arrangement Index
DID*i*	DKP Innovation Design Index
DIM*i*	DKP Implementation Index
DKP	Digital Knowledge Pack
DR*i*	DKP Resources Index
DSP*i*	DKP Student's portfolio Index
DWS*i*	DKP Weekly Structure Index
EL	Experiential Learning
ELA	Experiential Learning Ability
FAP	Farm Attachment Programme
FGD	Focus Group Discussion
GoK	Government of Kenya
ICT	Information and Communication Technology
MOA	Ministry of Agriculture
NGO	Non-Governmental Organization
PAR	Participatory Action Research
PCA	Principal Component Analysis
PD*i*	Problem solving and Decision-making Index
R*i*	Reflective Index
SEO	Search Engine Optimization
SPSS	Statistical Package for Social Science
TOC	Theory of Change
W*i*	Willingness Index

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, universities are under pressure to produce responsive professionals and competent graduates with practical skills (Betour El Zoghbi & Lambrechts, 2019). Higher education is now acknowledged as being pivotal for high level research and technological capacity in the knowledge economy. Additionally, it performs the fundamental role of forming the professionals who will in turn play a major role in a range of services (Coates & Morrison, 2016). Teaching at the universities frequently focusses on lecturing and structured practical lessons. According to Gibbs (1989), there is no simple correlation between what is taught and what is learnt owing to the limited scope for negotiation and construction of meaning during lectures. It is not easy to transfer meaning to students in lectures especially in agriculture (Ison, 1990). Admitting more students into universities without putting structures in place to take care of the conditions and approaches to learning, reduces the impact of university study, and at worst can waste precious years of young people's lives, create a hopelessness situation among the family members and incur huge debts (McCowan, 2014).

Higher education, if handled in the right way creates positive impacts not only to those who directly study in universities, but can potentially roll out through the whole society. Allowing students to apply their academic knowledge can result in maximization of yields. Beijing's China Agricultural University has demonstrated that it farms productivity can be improved through a project initiated in villages across the country. The project allows students to apply their academic knowledge to maximize crop yields. An evaluation of the project revealed that wheat production increased from 5,060 to 7,270 kgs per hectare (about 30.4% increase), while corn yields rose from 6,435 to 9,105 kgs per hectare (about 29.3% increase) in a period of one year (Jiao et al., 2019).

Every year in Africa, up to 12 million graduates enter the labour market with only 3 million of this number getting meaningful jobs. This shows that "the mountain of youth unemployment is rising annually" (Lelei & Weidman, 2012)). African newspapers are replete with stories of students' poor preparedness for the workplace and in particular, the lack of preparedness for the real contexts involved in their professional practice (Knight, 2003). A frequent descriptor is that graduates are 'half-baked' (Muiya, 2014). According to Billet (2015), there are many effective strategies adopted by higher education institutions, to embed employability competences into their institutional initiatives. One such strategy is

encouraging networking to enable students to interact with employers and real experiences in the labour market and supporting students in their personal development (Brynjolfsson & McAfee, 2014). This kind of initiative allows higher education institutions to develop an institutional narrative based on employability (Abelha et al., 2020). Additionally, such an initiative intends to prepare the graduates for their professional practice, which is directed towards an environment of uncertainty and constant change (Cranmer, 2006).

Kenya, like many African countries, faces a growing problem of high percentage of unemployed youths. Eighty percent (80%) of the country's population is under 35 years old. 35% of its youth are aged between 15– 34 years and have the highest unemployment rate of 67% (British Council, 2017). The growth and development of a country is dependent on the economic performance of a country. A declining economy has a very distressing effect on employment for graduates even where they are high-skilled (Munene, 2021). In Kenya, where economic performance has been relatively good, the cause of unemployment can be attributed to factors internal to education especially university curricula (Lewis, 2021). The 2020 Kenya National Bureau of Statistics reported that youth aged 20 to 29 years, the age bracket of fresh university graduates, had an unemployment rate of over 32.4 percent (Odhiambo, 2018). This includes graduates from popular degree programmes like medicine, engineering, technology and business.

The era of guaranteed white-collar employment for university graduates has waned in the last two decades, with many going through years of unemployment and underemployment (Omolo, 2013). Even high-demand professional disciplines such as the medical sciences, engineering, technology, and business have not been spared the scourge of unemployment. Forty-nine per cent of new graduates from Kenyan universities are not adequately prepared for the labour market (Republic of Kenya, 2014). This may be attributed to inadequacies in knowledge, skills, and attitudinal abilities levels among the students their fields of expertise (Boffo & Fedeli, 2018). However, giving student's opportunities to put theory into practice during their training, can contribute significantly to the student's hands on experience that relates to the real world of work (Abelha et al., 2020). One of the requirements by Commission for University Education (CUE) in Kenya is that, for universities to introduce new courses and in the course of reviewing existing ones, labour market conditions should be taken into account (CUE, 2018). In this regard, universities have incorporated internships, field placements and other job-shadowing opportunities in the students' fields of interest, in their curricula (Curtis & Mahon, 2010).

Egerton University, one of the universities that have established a niche in agricultural education training in Kenya, has developed an attachment programme that engages rural communities dubbed as Farm Attachment Programme (FAP). The stakeholders or the participants in the programme include: the students, host farmers, faculty lecturers, agricultural extension officers and the board of undergraduate studies (BUGs) which organizes and coordinates the FAP programme (Mungai et al., 2016). Students in this programme, pursuing agricultural and community development related courses are hosted by farmers for three consecutive years in the same farm. This is repeated every year when Egerton University sends out students on field attachment programme (Mulu- Mutuku et al., 2017). The first cohort of students that are hosted by the farmers are expected to initiate or implement projects. They can also come up with some process or product innovations and at the same time conduct a situational analysis of the hosting farm.

The second cohort follows-up on innovations initiated in the farm by the first cohort. The third and fourth cohorts improves on the innovations initiated in the farm carries out an evaluation and makes recommendations concerning the initiated projects/innovations. Over the years, since the inception of FAP, students have made notable progress. Some students have helped to organize farm operations and encouraged 95% of the farmers to design and maintain accurate farm records. In the process, farm planning and budgeting are evident routine activities adopted by many host farmers. In addition, students have encouraged the host farmers to make correct choice and use of herbicides, pesticides, postharvest storage, and marketing (Nyambura, 2015). Other impacts include students assisting farmers to establish vegetable gardens and orchards thus providing balanced diets for the farmers' families. Some female students have also assisted many of the farmers wives on new methods of preparing more delicious meals for their families. Some introduced new varieties of vegetable unknown the farm encouraged use of fuel-saving stoves. Those students who had prior knowledge in soils have assisted the host farmers in soil conservation measures (Kirgo, 2015).

FAP commences with a compulsory induction workshop organized by the university to prepare the students for the farm experiential learning. (Nyambura, 2015). According to Mungai et al. (2016), students on FAP require prompt and reliable source of knowledge. This may be the reason why a lot of time is spent during the induction workshop to guide students on sources of reliable knowledge. Other topical issues covered during the workshop include: interpersonal relations, communication skills, the roles of various stakeholders in the FAP

programme, how to conduct a farm situation analysis, the organizational structure of agricultural extension in Kenya and emerging issues in extension (Kirui & Mahuga, 2015). Among the sources of knowledge recommended for use by the students during FAP are: making calls to their faculty lecturers, carrying students' hard copy notes, using the internet, consulting the agricultural extension officers in the field, consulting students' peers and the internet. The aim of FAP, is to offer experiential learning to students and give them opportunity to put theory from lectures and practical sessions into practice (Mungai et al., 2016).

Experiential learning is the process of learning through experience, and is specifically defined as "learning through reflection on doing" (Felicia, 2011). Kolb's entire theory of experiential learning is based on this idea of converting experience into knowledge. With each new experience, the learner is able to integrate new observations with their current understanding. According to Kolb (1984), 4 abilities are necessary in experiential learning: The students' willingness participate actively in the learning experiences; ability to make reflection on the experiences the students are involved in, the competence to conduct analysis of the learnt experiences; ability to make prompt, valid and reliable decisions that are efficient and effective in addition to having the ability to solve problems. The final ability that was designed for the purpose of this study was the ability to make ability to make continuity arrangements for initiated projects/innovation. Experiential learning is an example of an instructional approach which is unguided or guided up to a very minimal level (Moon, 2004). These types of instructional approaches are very popular and intuitively appealing. However, due to lack of guidance, experiential learning is less effective and less efficient than other instructional approaches that place a high value on students' guidance in the learning process (Kirschner et al., 2006). The minimal guidance approach in experiential learning begins to recede only when learners have sufficiently high prior knowledge in their field of experience to provide "internal" guidance (Gardner & Bartkus, 2014; Moon, 2004).

Experiential learning experiences are most effective for students when there are opportunities for subsequent reflection with students required to discuss their experiences collectively and writing reflective reports. To be an active experiential learner, one has to be reflective and keeping a portfolio to record learnt experiences has been found to be an effective tool in the learning process (Alvarez & Moxley, 2004). Cournoyer and Stanley (2002), have shown the benefits of a portfolio for students include: expanding evaluation beyond traditional tests; providing a way to document accomplishments in learning; requiring the students engage in

self-evaluation of their professional development and supporting their self-awareness in finding the meaning and totality of their work ability.

Institutions in the agricultural sector should foster information and communication technology mechanisms to enable access to agricultural information and technologies (Mungai et al., 2016). A Digital knowledge repository, which does not require the use of internet can systematically capture, organize and categorize knowledge (Basten et al., 2017). The repository allows for data searching and quick data retrieval. It can take many forms to "contain" the knowledge it holds (Iqbal, 2017). It can also be used to find solutions to problems already solved and identify areas of improvement (Maier & Hadrich, 2011). When there is need to share knowledge and information, a digital knowledge repository can address the challenge. This has been found to be more effective particularly when the shared knowledge is available in written formats and can be applied in many situations (Figallo & Rhine, 2002) as it is the case in FAP.

This study set to assess the FAP design attributes, quantify the experiential learning abilities among students on FAP of Egerton University from 2016 to 2019, and assess the effects of the attributes on ELAs in a baseline survey. An intervention was then designed based on the findings in the survey and the effects of the intervention on students. Experiential learning was evaluated in a survey.

1.2 Statement of the Problem

Despite efforts by Egerton University to improve students' professional competences through EL in the field attachment programmes, Experiential Learning Abilities (ELAs) have not been quantified for the purpose of improvement. This is in spite of the universities being under pressure to produce graduates who are competent and responsive professionals. Effectiveness of EL is dependent on possession of ELAs and high Prior Knowledge. The university has initiated a field attachment programme dubbed as Farm Attachment Programme (FAP) to provide EL to its students pursuing agricultural and community related study programmes. Experiential Learning is characterized by unguided or minimally guided instructional approaches that make learning less effective and less efficient than other instructional approaches which place a strong emphasis on guidance of students in the learning process. However, EL begins to recede only when learners have sufficiently high prior knowledge to provide "internal" guidance and possess Experiential Learning Abilities (ELAs) to fast track learning from experiences. The ELAs have been identified as: the

willingness to participate actively in the learning experience, ability to reflect, analyze, solve problems and make decisions during the learning experience, and for the purpose of this study, ability to make continuity arrangements for initiated projects/ innovations. This study sought to evaluate the effectiveness of integrating a Digital Knowledge Pack (DKP) Innovation into FAP to enhance FAP program design attributes (including students', host farmers' and programme structure and implementation attributes) and improve students' practicum competences (ELAs). The DKP innovation attributes included DKP: weekly structure, students' portfolio, implementation enablement and resources. This thesis focuses on how digital content can be used to Replace, Amplify and Transform (RAT) knowledge. RAT is a theoretical model that can be used to study the role of technology in teaching, learning and curricular practices. Though developed for grade K-12, the model can also be used to understand application of technology in institutions of higher education, especially among the teachers who undergo pre-service teacher education. The initial objective of the RAT model was to design it as a self-assessment for pre-service and in- service teachers to improve the quality of their decisions as relates to technology.

1.3 Objectives of the Study

The purpose and specific objectives of this study are as outlined below:

1.3.1 Purpose of the study

The purpose of this study was to integrate a Digital Knowledge Pack (DKP) innovation into Farm Attachment Programme (FAP) and evaluate its effect on Experiential Learning Abilities (ELAs) among Egerton University practicum students.

1.3.2 Specific objectives of the study

The objectives that guided this study were to.

i. Characterize the design attributes of Farm Attachment Programme (FAP) of Egerton University and show areas of improvement among the practicum students
ii. Assess how practicum competencies (ELAs) are affected by FAP attributes among Egerton University practicum students
iii. Explore how DKP innovation design attributes integrated into FAP affect ELAs among practicum students in Egerton University.
iv. Evaluate the effectiveness of DKP Innovation integration into FAP in affecting ELAs among Egerton University practicum students.

1.4 Research Questions and Hypothesis

The research questions and hypothesis that were answered and verified respectfully in this study were:

1.4.1 Research questions

The research questions that guided this study were:

i. What design attributes characterize Farm Attachment Programme (FAP) of Egerton University and what areas can improve students' ELAs?
ii. How are practicum students' competencies (ELAs) affected by FAP attributes in Egerton University?
iii. How do DKP innovation design attributes integrated into FAP affect ELAs among practicum students in Egerton University.

1.4.2 Research hypothesis

H_{01}: integrating DKP Innovation into FAP does not affect ELAs among Egerton University students to a significant extent.

1.5 Significance of the Study

In this study, Digital Knowledge Pack (DKP) Innovation was designed and integrated into the Farm Attachment Programme of Egerton University. A baseline survey was conducted to help in diagnosis of the research problem as low levels of experiential learning abilities among Egerton university students on FAP. A digital knowledge pack was innovated in the planning phase and integrated into Fap in the action phase. An evaluation to assess the effectiveness of the intervention in improvement of the ELA levels was finally done. The attributes that were designed in the intervention and their effects on Students ELAs determined included: DKP weekly structure, DKP student's portfolio, DKP implementation enablement and DKP resources. The research methodology adopted in this study may be applied by educational researchers to assess experiential learning which is sometimes difficult to measure. Improving students ELAs may improve students' competences (knowledge, skills and attitudes) in the long term and thus enhance their employability skills including self- employment. Adoption of DKP technology in FAP is likely to bring out another success story where students will be required to carry only a simple toolkit which can be accessed online, instead of carrying bulky notes and text books during FAP. Farmers can benefit from the resources packaged in the DKP. Students can make references to the packaged resources to solve problems encountered in the host farms and make informed

decisions. The findings in this study may be of use to the Commission for University Education (CUE) that is mandated in formulating policies aimed to improve the standards of higher education in Kenya. Integrating DKP may enhance students' competences in field attachment programmes and this may give students better job shadowing experiences.

1.6 Scope/ Assumptions/ Limitations of the Study

The following section describes the scope, assumptions and limitations of the study

1.6.1 Scope of the Study

The study was carried out among students on FAP of Egerton University between the years 2016 and 2019.The action phase of the study was limited to students hosted at Njoro sub-County in Nakuru County in 2019. This research focused on integrating a Digital knowledge Pack innovation into Farm attachment programme of Egerton University. The measured ELAs were adopted from Kolbs (1984) and they included: willingness to participate actively in the learning experience, actively involved in the learning experience, ability to reflect on learnt experiences, ability to analyze learnt experiences, ability to make decisions and solve problems, and for the purpose of this study, ability to make continuity arrangements for initiated projects /Innovations. The study also assessed the FAP design attributes namely; students', host farmers' attributes and FAP structure and implementation attributes. Among the DKP innovation design attributes operationalized in this study were: DKP weekly structure, DKP implementation enablement attributes, DKP students' portfolio attributes and DKP resources.

1.6.2 Assumptions of the Study

The following assumptions were made in this study:

i. FAP programme would run as scheduled by Egerton University without disruptions.
ii. The students would be willing to use the DKP during FAP

1.6.3 Study limitations

The following limitations were noted limitations were:

i. There was a seasonality of the study population. It was only possible to collect data during the scheduled times of field attachment programme by the University. There being no way of rescheduling FAP, this seasonality affected the duration of the study.

ii. Some students took so long to respond to DKP innovation intervention hence the study used extreme case sampling to capture the innovative students who could use the DKP within the short period of eight weeks of FAP.

iii. Some students did not have laptops as had been anticipated, therefore in addition to using the DKP hard drive, a DKP folder was also uploaded in the google drive and accessed by students via their smart phones and cyber facilities. Internet bundles were also provided for accessing the google drive.

iv. Collecting data directly from host farmers introduced biasness. Most farmers wanted their students to benefit from an internship organized to Israel and distorted their responses. To address this challenge the data about the farmers were collected indirectly from the students. This data was found to be valid and more reliable.

1.7 Definition of Terms

The meanings of terms and phrases used in this study have been operationalized in the section that follows:

Digital Knowledge Pack (DKP): Refers to a digital application designed by the researcher for use by students on FAP. The application was uploaded in a computerized drive that allowed for installation of various content development tools these aids in digital knowledge packaging

DKP documents: Refers to documents in the DKP including power point presentations in the weekly structure section of the DKP. Students' portfolio where students can upload important FAP documents like the job analysis sheets, job preparation sheets and task analysis sheets. The documents also include video resources uploaded for use by the students.

DKP implementation enablement: refers to three features; the training workshops, online google groups and hyperlinks embedded in the DKP documents for ease of navigating different resources in the DKP

DKP innovation design attributes: These refer to digital pages created and enablement tools in the DKP drive namely; DKP weekly structure, DKP implementation enablement tools, DKP student's portfolio and DKP resources.

DKP Resources: This refers to knowledge resources packaged in the DKP including livestock, crop, agribusiness, agricultural engineering knowledge, videos, installed statistical computing packages and links to online resources.

DKP weekly structure: refers to the structuring of the DKP, including the power point presentations uploaded in the DKP to guide students in weekly activities during FAP.

Egerton University Practicum Students: These are students who are placed in the field attachment programme of Egerton University. In this study the attachment programme in focus is the Farm Attachment Programme where students are hosted on Farms by the farmers.

Effectiveness: Refers to the degree in which something is successful in producing the desired results. In this study the term effectiveness will be used to refer to the extent to which use of the DKP improved the experiential learning abilities among Egerton University students on FAP.

Experiential Learning Abilities: refers to four competences that are necessary for experiential learning to take place. They include, the ability to willingly participate actively in the learning experiences, the ability to make reflections on the experiences that one has engaged in to participate in the learning experience, ability to reflect on what is learnt, having; analytical skills, ability to make accurately decisions and solve problems effectively and efficiently (Kolbs, 1984). In this study the same meaning was adopted except that in addition, possessing abilities to make continuity arrangements for initiated projects in the host farm, was also included.

Experiential Learning: This refers to change of behaviour that comes as a result of acquisition of knowledge, skills and attitudes derived from experiences, it can also be defined as learning through reflecting on what we do. In this study experiential learning referred to learning from farm experiences during FAP.

FAP design attributes: This refers to the FAP design attributes; students (students' prior knowledge in agriculture, gender, study programmes, academic departments, students' year of FAP attachment and Faculty), host framer (age, education level, farming system, level of income) and programme structure and implementation characteristics.

Farm Attachment Programme (FAP): Refers to programmes that are designed to allow students to have hands on experiences where they apply the theoretical knowledge, they acquire in class into a farm acquired in class expand the setting of learning experiences beyond the traditional school environment to farm and community. Students are provided with experiential learning through practical and attachment programs, among other approaches (Egeru, et al., 2016). In this study FAP refers to a programme organized by Egerton University for students pursuing diploma and undergraduate studies in their year three or four. The students are hosted by farmers in their farms for a period of eight to ten weeks.

Host Farmer: In this study, a host farmer is a person who owns a farm and is engaged in various agricultural enterprises. In addition, this farmer supports students on FAP from Egerton University for a minimum period of eight months.

Innovation: Refers to anything that puts into use new or existing knowledge to create value, whether social, or economic (Maatman et al., 2011). In this study innovation refers the FAP programme itself and the enhancement to FAP through integration of the designed DKP. The

DKP innovation design attributes include weekly structure, student's portfolio, implementation enablement and resources.

Knowledge: Refers to comprehension by humans of a subject matter that has been acquired through proper study and experience. In this study, knowledge refers to all the subject matter related to the Farm Attachment Programme

Knowledge Capturing: This is process of converting the knowledge or experience that resides in the mind of an individual into an explicit representation, whether in print, electronic, or multimedia form (Girard, 2015). The same meaning was used in this study.

Knowledge Sharing: Refers to a subset of knowledge management encompassing the exchange of knowledge (information, skills, experiences, or expertise) within and across organizations. It may also be seen as dissemination of knowledge from the source to other members of the organization

Learning: Refers to a relatively permanent change in a person's knowledge or behavior due to experience" (Mayer, 1982, p. 1040). In this study the same meaning was adopted

Student's attributes: Refers to students' prior agricultural knowledge, gender, study programmes, students' year of attachment, study programme department and faculty.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Primary and secondary sources of previous and related literature to this study were sourced to contextualize variables in this study. Specifically, the reviewed literature included: Philosophical foundations of experiential learning, philosophical foundations of University Education, Experiential learning and improvement of students' practicum competences, creating effective digital knowledge, process of branding an innovation and a theoretical framework. Finally, to understand the conceptualization of the whole study, a graphical conceptual framework showing interactions of the study variables has been provided.

2.2 Experiential Learning Philosophical Foundations

Learning through experience also known as experiential learning is an approach to learning where acquisition of knowledge, skills and attitudes also known as competences are obtained from experiences. According to Kolbs (1984) experiential learning takes place where the learners take time to reflect on what they have learnt. The concept of learning through experience is very old (Felicia, 2011). The Greek philosophers including Aristotle in around 350 BCE, wrote in the Nicomachean Ethics that there are some things that must be learnt by doing, particularly those that we learn before we can do them. (Kraut & Richard, 2006). One of the earliest philosophers Young Hegelian Cieszkowski, used the term praxis to mean that, changing a society required action-oriented learning (Mclellan, 1970). The argument he posited was that, tangible practical activity was necessary to resolve the divisions and contradictions that were so deep in the mind of a man. This he said, had a direct influence in his social life However, as an expressed educational approach, experiential learning is of more current vintage.

David A. Kolb, came up with the modern model of experiential learning.in the beginning of 1970. The modern theory of experiential learning, is attributed to him. He received great inspiration from the works of a pragmatist John Dewey, Kurt Lewin, and Jean (Miettinen, 2000). Piaget. According to Dewey (1897), education is a process of being and not meant to prepare a people for future life. David Kolb made the work of Dewey, Lewin and Piaget, popular through his recurrent model stating that experiential learning is a process that can take many dimensions whose starting point is a tangible experience. This is followed by an

observation that is reflective in nature. In his model, the period of reflection is followed by formation of abstract concepts from which further experiments are conducted (Dunlap et al., 2008). The learner is first engaged in an activity actively before reflecting back consciously on that activity also known as experience. The learners attempt to conceptualize a theory or a model of what is observed follows. Finally, the learner plans how to test a model or theory or plan for a forthcoming experience. Therefore, according to Kolbs, experiential learning is the recurring process by which learners change their experiences into useful knowledge. Every step taken helps to accumulate knowledge from earlier experiences. This also prepares the learner for future experiences. As students reflect on their experiences, and link with previous knowledge, learning takes place (Roberts, 2011).

Experiential learning is an example of instructional approaches where the teacher or the instructor does not play a major role of guiding the students and where it happens, it is only to a very minimal level. This approach is liked and it is fulfilling (Moon, 2004) probably because of the freedom it grants to the teacher to some extent. It has been found that this approach is not as effective and efficient as other learning approaches that emphasize strongly on guidance of students in the learning process (Kirschner et al., 2006). However, experiential learning becomes better than those other approaches only when the learners have sufficiently high prior knowledge in their field of experience and possess experiential learning abilities to provide guidance from within. Piske and Steinlen (2022), in their discussion on role and importance of prior knowledge for learning asserts that, humans come to formal education settings with a range of prior knowledge, skills, beliefs, and concepts that significantly influence what they notice about the environment and how they organize and interpret it. This in turn affects their abilities to recall, reason, solve problems, and acquire new knowledge (Clark et al., 2014).

Experiential learning can take place without a teacher and depends wholly on the meaning-making process of the learner's direct experience. Although the gaining of knowledge is an inherent progression which occurs naturally, an open learning experience requires certain elements (Itin, 1999). Knowledge is continuously gained through both individual and environmental experiences and in order to achieve accurate knowledge from an experience, it is necessary to that the learner possess four abilities (Kolb, 1984): they must be willing to be actively engaged in the learning experience; they should also possess the ability to make a meaningful reflection on what they have learnt reflect; They should have the ability to

analyze the learning experiences they engage in. sometimes this analysis may require possession of competences like having prior knowledge on how to accurately analyze data. Analytical skills also enable the learner to conceptualize the experience; Last but not least is the ability of the learner to make informed decisions and use their problem-solving skills to address the challenges encountered during the learning process. In a study carried out to improve academic performance through innovative experiential learning experiences, it was found that getting involved in an experience-based practices and simulations constituted an effective approach to develop students (Leal-Rodríguez & Albort-Morant, 2019). There is a role for simulation-based education to link knowledge and skills, with technology offering improved facilities to provide opportunities to learn for practice (Flaherty, 2022).

There are other forms of learning that resemble experiential learning but may not qualify to be experiential in nature. A good example is what is commonly known as Hands-on learning. The students are not involved in reflective experiences though and therefore is not considered one of the experiential learning approaches (Dunlap et al., 2008). Experiential learning is different from rote or didactic learning, which are characterized by memorization and routine learning. The learner in rote learning is not an active participant in the learning process (Felicia, 2011). It bears some resemblance to other forms of active learning including: action learning, adventure learning, free-choice learning, cooperative learning, service-learning (Felten & Clayton, 2011), and situated learning (Itin, 1999). A new technology has also evolved which enables learners to apply and practice novel learned skills through virtual role-plays under the professor's guided supervision (Flaherty, 2022). Experiential education allows the learners to first engage in the learning experience before allowing the students to reflect on the learning experience for acquisition of knowledge, skills and attitudes, commonly known as competences. or new ways of thinking (Klein & Riordan, 2011).

According to Ghaye (2010), there are other forms of experiential learning that take many forms including: field trips, laboratory experiments, role playing and work placements. One thing that should be common to all the forms of experiential learning is that the engagement in experiential learning should be purposeful, meaningful endeavors that encourage a “big picture” outlook. The experiences must be personally and emotionally relevant to the students to enable them make connections between the learning they do and the real world of work (Moon, 2004). Students are given openings for reflection by judgmentally making reflections on what they have learnt. reflecting on their own learning, connecting their experience to theory and gaining insight into themselves and their interactions with the world.

Students can also consider how their new skills, knowledge and experiences are transferrable to other situations or environments, including those outside of academia.

Experiential learning is potentially capable of bridging gaps in employee training some of which are traditional training methods that have to yield positive outcomes (Rutt et al., 2013). Organizations which have embraced experiential learning methods have had positive impact in managing their operations. Some of these organizations have managed costs of operation to 50 per cent. This has helped in some areas to advance the utilization of manpower. Further, in the training approaches characterized by learners who are passive have been found not to be popular with the young generation commonly referred to as the millennial employees. Research shows that millennials respond better to approaches of learning that engage them actively as opposed to passive learning methods (McCartney & Boschman, 2020).

The importance of prior knowledge in the learning process is paramount. (Chapman (1992) highlighted the importance of the teacher providing the minimum structure necessary to assist students in reaching the intended outcome. Valuing prior knowledge and experience; promoting learner responsibility through facilitating rather than directing learning; encouraging learners to test out and apply new knowledge, and using small-group work to foster explicitly the elusive skills of critical thinking and reflection are key in experiential learning Rittle-Johnson et al., (2009). This agrees with what was posited by Kolb (1984).

2.3 Philosophical Foundations of University Education

Higher education is recognized as essential for research and technological capacity that are of high levels in the knowledge economy, but it has another basic role of making the professionals (Coates & Morrison, 2016). Producing graduates with the right practical competences in their areas of specialization is paramount (Lauder, 2020). Higher education has the potential to contributes to strongly to development (Bony & Walker 2016; Castells 1994; McCowan 2016, 2019; Oketch et al., 2014). However, most universities have focused their training on describing their mandate as upholders and conservers of knowledge (Kartashova, 2015). This has the effect of bringing out an image of knowledge in form of a good that can be stored and then disseminated (through a lecture) to a receiver (student). This in most cases results into structural failure of teaching. According to Blackmore (2018), teaching at the universities frequently depends on lecturing and structured practical activities. Yet, there is no simple correlation between what is learnt and what is taught. There is usually minimal scope for conciliation and building up of meaning (Gibbs, 1998). Meaning is not

easily transferred to students in lectures. This is more so in subjects like agriculture that require more use of the psychomotor domain for learning to take place.as Gibbs (1981) stated: *"This preoccupation with teaching has…. actually, constrained the effectiveness of higher education and limited its abilities to meet society's demands…. We might say that we are now beginning to perceive that the purpose of education is learning and we are beginning to realize that frequently teaching interferes with learning*"

The Carnegie Forum Task force investigating teaching as a profession in the USA argue that: *"Students must be active learners busily engaged in the process of bringing in new knowledge and ways of knowing to bear on a widening range of increasing difficult problems. The focus of schooling must shift from teaching to learning, from the passive acquisition of facts to the active application of ideas to problems" (Carnegie Forum on education and the economy, 1986).*

Table 1 shows the main differences between knowledge traditionally traditions knowledge attained from universities. The knowledge can be categorized as *Scientia*, *teche* and *praxis* (Ison, 1990*)*. *Scientia produces knowledge that is* propositional; *teche* knowledge is more practical while praxis produces knowledge that is experiential and attained from experiences. Paulo Freire explained the meaning of praxis in their book Pedagogy of the Oppressed as "reflection and action directed at the structures to be transformed (Freire, 1970). The teacher in *Scientia* is a professional, teche teachers are regarded as masters and in in praxis the teacher is only an enabler or a facilitator (Cronin, 2017). The other major difference between the three traditional knowledge is in the purpose of learning. In *Scientia,* learning is for knowing, learning in *teche*, is for doing, and in praxis, the main reason for learning is for "being" (Packham, 1998). It can be argued that the role of university education is for being since universities are mandated with the role of forming professionals. Another parallel can be drawn from the goals of research in *Scientia* where the emphasis is put in abstract knowledge, *Teche* attention is put in workplace solutions while in *praxis,* major consideration is given to the local theory and action change (Bawden & Macadam, 1988). The rest of the distinguishing features are shown in Table 1.

Table 1

Distinctions between different traditions of knowledge

	Scientia	Teche	Praxis
Focus knowledge	Learning for knowing	Learning for doing	Learning for being
produced structure	propositional	practical	experimental
Teacher's role	Subject discipline	crafts	issues
Teaching strategy	Expert	master	Facilitator
Teaching strategy	Lectures on theory	Practical demonstrations	Real world projects
Research style	Basic (experimental)	applied	action (participate)
Role of a researcher	Producer of knowledge	Producer of solutions	Co-creator of improvements
Change Basic philosophy	Constructivism	Positivism	Nutarianism
What can I now do?	Who I am becoming	Focus of reflection	What I am becoming?

Source: Bawdem and Macadam (1988)

2.4 Experiential Learning and Improvement of Student's Practicum Competences

There are many learning approaches that puts the learner at the center of what they need to know (Rutt et al., 2013). Such approaches have the potential to bridge the gaps in employee training where other traditional training methods have failed to deliver. Approaches like scaffolding which has conventionally been used to describe the procedure whereby a teacher or more experienced peer supports a learner by changing the task for learning to allow the learner to solve problems or execute tasks that would be impossible to the learner (Reiser, 2004). These approaches, they say, follow the Chinese proverb, "I hear and I forget. I see and I remember. I do and I understand," (Reynolds, 2011). Experiential learning model using such an approach to learning. Competence development is not a production process that can be planned and directed from outside but it is rather an individual and social endeavours that ensures growth of complex world. Which happens when an important and complex professional activity (If there is no room for the engagement and participation of those who are to develop their competences, there will hardly be any adequate competence development (Billett, 2015).

The value addition of competences is that they have capabilities which consist of clusters of knowledge structures and cognition, interaction, affection, and necessary psychometric skills, attitudes, and values, which are necessary for carrying out tasks, solving problems, and effectively functioning in a certain profession, organization, position, and role (Mulder, 2001. Competencies are a means to performance (Biemans et al., 2009) as they are derived from professional practice and only get meaning in a specific context when they are sufficiently specified.

2.5 University's Role in Forming Professionals

University graduates hold more knowledge than necessary but they show a lot of inadequacy in vital competencies required in the job markets (Becker, 2020). Exposing students to real life situations acquaints them to the real working environment (Mungai et al., 2016). Universities contribute to a country's growth and development agendas by producing graduates that have competences required in the growth and development of a country (Biemans et al., 2009). In their endeavours to produce competent professionals the university must focus on: the kind of knowledge produced, the teaching strategy, the research style, the role of the researcher, the research goals, the basic philosophy and focus of reflection on what is taught (Castillo-Montoya, 2019). Based on employability, universities have developed some wits to enhance students' employability skills in their institutional mandates (Billet, 2015). Majority of the universities have implemented effective strategies by embedding employability skills into their curriculum (Kornelakis & Petrakaki, 2020). The strategies include either or all of the following; putting structures in place to cater for career guidance among the students; including curricula and extra curricula activities that reinforce employability skills among the students; allowing students to interact with potential employers in the course of university training which enables the students to networking between students and would be employers and thus exposing the students to real experiences in the labour market; supporting students in their personal development and encouraging international mobility and critical thinking regarding their learning experiences as a whole (Abelha et al., 2020).

Many universities have chosen the strategy of reinforcing employability, in their curricula set up. Embedding FAP (a special type of field placement programme), in the Egerton university's curricula is crucial in reinforcing acquisition of competences that enhance employability skills among students (Mungai et al., 2017). University students in the FAP are

particularly those pursuing agriculture and community development study programmes. These initiatives tend to adequately prepare the graduates for their future careers which is geared towards an atmosphere of uncertainty.

2.5.1 Field Attachment Programme and its Role in Experiential Learning

A field-based practical training experience, prepares trainees for the tasks they are expected to perform on completion of their training (Mungai et al., 2016). According to Kibwika (2006), the importance of field attachment in inculcating competencies needed for career development cannot be disputed. Moreover, the students themselves, the University partners and the teaching units in the University do recognize and appreciate its value (Cleak & Wilson, 2018). It also serves as a linkage between the university and various partners who consume services and/or products of the University (Baird, 2015a). Exposing students to potential professional bodies while still undergoing training is crucial. These bodies help the student to understand importance of safeguarding public and their own interest (Harvey et al., 2014)

Field attachment is considered a job-shadowing (or work shadowing) experience, which is an educational program where university students or other adults learn about a particular occupation or profession (McCarthy & McCarthy, 2007). Field attachment is a name used to refer to any opportunity given to observe someone doing their job in the workplace (According to Kusnoor and Stelljes (2016), job- shadowing is where an individual getting an experience of the role of another individual gains an insight into that particular work area. This helps the individuals who are shadowing to understand the particulars of the job without the commitment of the responsibility (Zahara, 2019). In career development, job shadowing can help to get a better sense of options available and the required competencies for various position options. The purpose of field attachment is to produce practically oriented graduates that meet the required job-related competences of their future employers (Boffo & Fideli, 2018). This attachment then serves to create job shadowing for students in addition to gaining unforgettable life experience (Sweitzer & King, 2013).

Field attachment is organized through six steps namely: Program management, Budgeting, Pre- placement, Placement, Supervision and Evaluation (Kibwika, 2006). Fortune et al. (1985) argues that field attachment is able to translate the university grades obtained into improved services in communities. Some of the activities of field attachment include pre-placement activities where academic supervisors visit potential students' organizations and

discuss with the staff on what is expected of the student on field attachment and the organization (Knapp & Fisher, 2010b).

Pre-placement is an activity consisting of three tasks namely; visits to field attachment areas and joint planning, briefing students and re-orientating the academic staff. Duration and timing of field attachment is important and according to Kibwika (2006), the minimum duration of field attachment is eight weeks. The students' roles and responsibilities include having positive attitude towards learning by practice (Gardner et al., 2018). Students are required to respect all field supervisors and any other persons they interact with throughout their field attachment period regardless of their background training and social differentiation (Bogo, 2020). Another expectation is that of willingly working wherever they are posted/attached in addition to developing the day-to-day work plans with their field supervisors. The students write and provide reports and other forms of feedback to the University and the host partners. This includes: Self-evaluation, Program evaluation, Supervisors' evaluation and Site evaluation (Baird, 2015b).

Partnership with the collaborating organization is negotiated, formalized and strengthened for sustainability of the field attachment program (Cleak & Wilson, 2018). University Partners participate in the planning, supervision and evaluation of the students on field attachment Clayton et al. (2013). Bandy (2011) posits that, visits by lecturers are for the purpose of ensuring that students are engaged in various aspects of work that are relevant to their occupational areas. The visits minimize the chance that students are taken advantage of and used as cheap labour. Additionally, the visits offer lecturers the opportunity to monitor students' progress and meet with students and workplace staff, (especially supervisors), to discuss any problems of concern to any of the stakeholders (Kibwika, 2006). The supervisors provide on-site technical and professional guidance to the students on field attachment throughout the field attachment period. They also provide feedback to the University on the experience of the field attachment program. They commit their organizational facilities and for effective implementation of the field attachment program. The partners engage in a mutual learning exercise together with the students and staff from universities (Cleak & Wilson, 2018).

On matters assessment of students, previous studies have shown that there should be no hidden agendas in assessment. The assessors should be prepared to justify to students the grades or scores they give them, and help students to work out how to improve. Additionally,

assessment criteria need to be understandable, explicit, and public (Chinyemba & Bvekerwa, 2011). A deep analysis of the responses extracts raises more questions in terms of the University's approach to assessment of industrial attachment (Kibwika, 2006). With respect to programme objectives undoubtedly, allows for a fair treatment of the assessment. It is important to give the individual student to judge their own achievement as active participant of the assessment process by involving them in the feedback loop.

2.5.2 Farm Attachment Programme of Egerton University

Field attachment programmes for students undertaking agricultural and community related study programmes have focused placements of students in government ministries and parastatals in Kenya. This contradicts other countries like Zimbabwe (Edziwa & Chakamba, 2012) where students are hosted by the farmers. According to Kibwika (2006), students' placements in the farms allow them to learn directly from farm experiences. Through this programme innovations have been initiated in the host farms (Egeru et al., 2016). Egerton University in Kenya has initiated a unique type field attachment programme dubbed as Farm Attachment Programme (FAP) where students are hosted by the farmers. Attachment on farms gives students chances to understand the social realities of the host farmers and hence become better placed to address the challenges encountered by the farmers. The students are able to conduct a SWOT (Strength, Weaknesses, Opportunities and Threats) analysis of the farmer and propose extenuation measures to some of the problems in the host farms (Mungai et al*.,* 2016).

FAP has another benefit of providing networks between the university and the community of farmers in the country. Further, FAP has brought about enhancements of agricultural productivity (Mungai & Gitau, 2017). Other positive bearings as a result of the implementation of the programme include; improved responsiveness to employment of agricultural innovations by farmers and students, exposed the necessity for curriculum review and need for prompt, reliable and unbiased agricultural information, it has encouraged the ethnic integration (Kirui & Mahuga, 2015). FAP has also contributed to instilling the mandated values of Egerton University and competitiveness in Kenya (Mulu-Mutuku et al., 2016) since the FAP platform allows students to interrelate with the relevant participants in the agricultural sector.

2.5.3 Role of experiential learning in Agricultural Education

The practical nature of agriculture as a subject blend well with the experiential learning approach

(Arnold & Osborne, 2006). This approach allows students pursuing agriculture to put into practice the theoretical concepts acquired in class which is different from supervised agricultural experiences (Rubenstein & Thoron, 2015). In addition, the students also apply knowledge acquired to real life situations (Cheek et al., 1990). However, for effectiveness of this method, the experiential learning activities must be planned correctly to reinforce the link between acquisition of knowledge and life skills. The level of engagement is unswerving and focused, addressing a real-world problem in a natural setting (Bammer, 2013).

According to Dewey (1938), true learning is based on experiences, continuation of learning demands that, one must constantly interrogate and assess their own experiences. Pragmatic approaches do not refer to a set of actions or circumscribed to specific goals. This liberty in experiential learning permits the student's investigation and the results can be erratic and unlimited. Experiential learning focuses on the application of classroom instruction, encourages students to be actively engaged in their own learning, and connects prior knowledge to new knowledge. The student is required to use their minds and discover learning for themselves (Chapman, 1992). Experience plays a vital part in the learning process and therefore agriculture instructors ought to stress on this notion when designing the curriculum (Jandhyala, 2017). Experiential learning presents a perilous link between the classroom and the real world. To improve abstract theories, vigorous participation with specific projects, group actions, and real-life situations are essential. Quality experiences must not only advance the learner's mental growth, but also establish connections, be focused, and encourage future interactions with new experiences. The teacher must generate and guide student experiences so as to enhance enjoyment, engagement, and influence their comportment to pursue out experiences (Leal-Rodríguez & Albort-Morant, 2019). In addition, students have demonstrated great interest in integrating computer-based technologies in their learning (Guo, 2007)

2.5.4 Digital Transformation in Higher Education

University students are the most substantial users of Information and Technology (Kaminski, 2009b). Certain factors can be used to explain the high consumption of Information Technology (IT) including; interactive/societal efficacy to sustain their social relationships, the ease of speaking to whoever they desired to speak to, and reduction of traveling costs, most of the students are information pursuers and digital technologies provide exhaustive information, comprehensive information, consistent information, or various sources of information (Flanagin et al., 2001; Kaye et al., 2002). The most

important of important factors at all times being the ability to connect people across time and space (Rice, 1984). IT has massively prolonged connectivity which enable people to network globally, thus creating a virtual community (Fulk et al., 1995; Simons et al., 2004). Further, IT was found to be important in group assignment, where everybody contributes by joining in an online group meeting.

According to Al-rahmi and Othman (2013), digital transformation affects universities in that the new cohorts of students exhibit new requirements. A study conducted to survey changes in collaboration and communication platforms between various groups of members at the university found out that, Bachelor and Master Students preferred the usage of social network sites for collaboration and communication while Ph.D. students and employees do not. Even though an increasing number of modern platforms for direct communication is offered, the results showed the most preferred mode of communication among the students was via the emails.

2.6 Assessment of Experiential Learning

Assessment of experiential learning may pose some challenges due to its variability and unpredictability (Schwartz, 2012). How one student chooses to solve a problem will be different from another student, and what one student takes away from an experience may differ from their peers. Schwartz (2012) continues to argue that, in experiential learning, the process is as important as the final product. Therefore, there is need to develop assessments that measure success in both the process and the product-each area may require separate learning outcomes and criteria. According to Wurdinger and Carlson (2009), some of the assessment strategy considered as appropriate in assessing experiential learning is allowing students to define how their work will be judged which may entail: choosing what criteria will be used to assess their work, or help create a grading rubric; creating a reflective journal or a portfolio (Hughes et al., 2019), reflection on critical events that took place during the experience (Breuing, 2011); essay writing (Ehizadeh et al., 2011) report, or presentations on what has been learnt which could be arts-based, multimedia or oral preferably with references to excerpts from reflective writing; Self-awareness tools and exercises, for example questionnaires about learning patterns; Short answers to questions of a ‘why’ or ‘explain’.

According to Hansen (2000), inherent motivation surpasses extrinsic motivation in experiential learning. The learner in most cases initiates the learning and controls it. Usually, the goals of learning are set by the learners in addition to being accountable to actions. Kolbs (1993) refers this as the willingness to be actively involved in the learning process. Allowing students to reflect on learning experiences encourages students to critically examine a concrete experience (Arnold & Osborne, 2006). This agrees with Proudman (1992) who postulated that reflection period ensures students take up responsibility for their own learning and engages the learner mentally and emotionally in the recent experience. Analysis and reflection are necessary in the learning process because the Lerner is made to value is studied. Further, analysis and reflection gathered from an experience extends the learning to a larger context.

The skills to solve problems are necessary in experiential learning. Problem-soling is the process of taking everything known about problem and dividing it into two categories: Divergent thinking and convergent thinking (Hommel et al., 2011). Deviating thoughts also known as divergent thoughts are new ways of approaching a given situation and convergent thoughts focus on evaluation of solutions. The next step in problem-solving and decision-making is to comprehend and explain divergent issues, consider and assess alternative solutions. The term that collectively describe this step is brainstorming (Mind Tools, 2020). Secondary problems must be analyzed and a path that implements the solution to the problem developed. One has to think creatively, abstractly, and conceptually to come up with alternative solutions to problems. Solutions may change with time and new problems keep emerging which calls for creativity (Warren, 2005).

2.6.1 Importance of Technical Knowledge in Problem Solving

One of the perquisites to problem solving is prior technical knowledge that relates to one's field as it sharpens one's skills (Cees et al., 2019). Technology use has also become paramount in problem solving skills and making use of it can improve the skills. The following factors have been identified in improving problem solving skills among students; acquisition of technical knowledge related to one's field, seek out opportunities to solve problems, implement the techniques of practice and role play, observe how others provide solutions to problems, put emphasis on the solution and not the problem, define and understand the problem clearly, develop logical thinking, develop analytical skills, generate as many solutions as possible and inculcate the traits of diligence, resourcefulness and conscientiousness. It is important to note that development of problem-solving skills is

regarded as significant in facilitating the implementation of tasks and activities in a productive manner and in achievement of personal and professional goals. This liberty in learning allows for student discoveries and the outcomes can be random and unlimited. Experiential learning emphasizes on the application of classroom instruction, encourages students to be actively engaged in their own learning, and connects prior knowledge to new knowledge. The students must learn to use their minds and explore learning for themselves (Chapman, 1992).

2.6.2 Importance of a Portfolio in Problem Solving

An active learner has a reflective mind and a portfolio can be used to record daily reflections and enhance experiential learning (Alvarez & Moxley, 2004). The benefits of a portfolio for students include; expanding evaluation beyond traditional tests (Cournoyer & Stanley, 2002), providing a way to document accomplishments in learning, requiring the students engage in self-evaluation of their professional development (which can result in defining their professional self and supporting their self-awareness and finding the meaning and totality of their work (Kalra et al., 2017). Schatz and Simon (1999) posited that a portfolio can provide a concrete way to link curriculum to practice. Recording day's events gives students chances to reflect (Cranmer, 2006). When things don't turn out as premeditated, one can learn from their blunders and take them into account for future actions. In addition, keeping a journal to remind one of the pasts, is a good way to improve one's intellectual and analytical skills. Analytical skills are soft skill (Sasmitatias & Kuswanto, 2018) s that permit persons to critically evaluate intricate state of affairs and produce with practicable solutions within a realistic time frame. Analytical skills cut across a wide range of competencies, from forecasting to problem-solving—all of which empower individuals to analyze data patterns, extract valuable insights and arrive at meaningful conclusions. An important part of being analytical involves being alert and remaining stimulated. Reading on a more frequent basis will help keep the mind running, force one's brain to think in new ways and encourage viewing ideas differently.

According to Fitch et al. (2008), a portfolio can be expanded to include eportfolios that integrates competences across courses, connects knowledge and skills to field work and engages in ongoing self -reflection and peer review processes. A collective documentation done in a portfolio has been found to be effective in helping students to become "self - authors" (Lee-Ann et al., 2014). A portfolio is an assortment of certain resources that validates one's knowledge, skills and expertise accumulated in a notebook or special type of

collection (Levišauskait, 2010). The portfolio offers a powerful opportunity for students to engage in critical reflection and make up their minds about the merits of a particular learning experience as well as plan their next steps in the job career and further education. Heron et al. (2004) recommends that in order for the portfolio to be helpful, it should complement the students' experience in field not take attention away from it. In order to meet this expectation, consider how the portfolio can be helpful in both your learning and as a means of demonstrating your competence.

2.6.3 Engaging in Problem Solving Activities and Becoming Analytical

Ability to solve problems and being analytical are important in experiential learning. According to Forte (2011), thinking analytically is a competence like masonry or driving a car. It can be taught, it can be learned, and it does improve with practice. However, like many other many other skills, such as riding a bike, it is not learned by sitting in a classroom and being told how to do it. Analysts learn by doing (Heuer, 2012). When somebody enquires about an issue, they're often requesting for clarification and understanding. It is often good to compare viewpoints form different people and this is achieved by expressing curiosity and asking questions. Sometimes your questions will lead you to a different answer than initially expected (Forte, 2011). This is commonplace in any problem- solving situation and actively supports the brain to think more analytically. Another trait that one has to develop in becoming analytical is becoming more observant (Bandura, 2014). Paying attention to detail and being observant improves one's analytical skills (Eskritt & Arthurs, 2006). Detailed observation allows one to process the way things work and interact. In addition, they posit that using one's senses and actively engaging in the world around sharpens one's analytical skills. Experience plays a major role too in developing analytical skills (Beard, 2010). Knowledge is also created from combination of grasping and transforming experience (Kolb, 1984).

Students often experience anxiety about effectively dealing with problems and challenges in the field of work (Warren, 2005). Furthermore, students may not have the knowledge, skills, and abilities expected and needed in field, if these skills are not developed through other courses within the curriculum (Alex-Asansol & Ryan, 2008). However, according to McClelland (1995), engagement exercises are effective strategies to create experiential opportunities for students to learn necessary skills prior to the field experience. The Problem-solving process learning activity is based on the principles of Situated Learning Theory (Lave & Wenger, 2016). This theory holds that, learning requires collaborative interaction with

others and requires students to problem-solve in the midst of a learning activity.

In conclusion, experiential learning opportunities are a valuable pedagogical tool for faculty to transfer knowledge, skills, and abilities, and to provide numerous professional development benefits to students. Engagement exercises like the Problem-Solving Process are effective strategies to create experiential learning opportunities for students to develop necessary knowledge, skills and attitudes. This experiential exercise can facilitate students' transitions from student to beginning practitioner by addressing students' anxieties about entering field placement, encouraging students to venture beyond their comfort zone, developing practice skill sets not addressed in other courses within the curriculum, and actively engaging students in the learning process.

For any type of course delivery, including experiential learning courses, course evaluation can play a formative role, a summative role, or both. Evaluation is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards. It can assist an organization, program, design, project or any other intervention or initiative to assess any aim, realizable concept/proposal, or any alternative, to help in decision-making; or to ascertain the degree of achievement or value in regard to the aim and objectives and results of any such action that has been completed (Arah, 2002). The primary purpose of evaluation, in addition to gaining insight into prior or existing initiatives, is to enable reflection and assist in the identification of future change. It can be used to improve a course, and it can be used to determine the fate of a course. Course evaluation can inform academic governance decisions about credit weight allocation, the appropriate course pre-requisites and level of study, the costs associated with delivery, appropriate section sizes and staffing models, and can also serve as an effective means of gaining information that can be used to promote the course

Development of evaluation questions, requires one to draw upon the order of thinking promoted by backward design can prove to be a helpful mindset to adopt. Given that the main purpose of any course is always to cultivate student learning, it makes sense to privilege experiential education course evaluation questions that can get at how well the course functioned to help students achieve intended learning outcomes. When planning evaluation questions, consider first what learning outcomes students are meant to achieve through the experiential education course and what level of competence or sophistication was desired.

While developing the evaluation questions, formulating questions associated with key components of the experiential learning course is done (Stirling et al., 2016). This includes: its learning outcomes, assessments, learning activities and resources. Questionnaires are a valuable method of collecting a wide range of information from a large number of individuals, often referred to as respondents (Robinson, 2017). What is often referred to as "adequate questionnaire construction" is critical to the success of a survey (Andrews, 1984). Inappropriate questions, incorrect ordering of questions, incorrect scaling, or a bad questionnaire format can make the survey results valueless, as they may not accurately reflect the views and opinions of the participants. Different methods can be useful for checking a questionnaire and making sure it is accurately capturing the intended information. Initial advice may include: consulting subject-matter experts, using questionnaire construction guidelines to inform drafts, such as the Tailored Design Method (Risler, 2010), or those produced by National Statistical Organizations. Empirical tests also provide insight into the quality of the questionnaire. This can be done by: conducting cognitive interviewing, by asking a sample of potential-respondents about their interpretation of the questions and use of the questionnaire, a researcher can carry out a small pretest of the questionnaire, using a small subset of target respondents. The results can inform a researcher of errors such as missing questions, or logical and procedural errors. Estimating the measurement quality of the questions can be done for instance using test-retest and quasi-simplex (Heise, 1969). According to Andrews (1984), a questionnaire can be used for predicting the measurement quality of the question. This is made possible by use of Software Survey Quality Predictor [SSQP] (Saris, 2014).

2.7 Knowledge and Information Management

Knowledge Management (KM) involves getting the right information within the right context to the right person at the right time for the right purpose. KM is also the process of creating, collecting, organizing, refining, disseminating, and maintaining knowledge so that it is utilized by the stakeholders (Basten, 2017). Organizations that are keen in ensuring access to latest thinking, faster access to knowledge, better sharing and knowing who’s doing what have their success pegged in knowledge management. In addition, managing knowledge avails novel approaches, new ideas, faster problem solving, new hires, in addition to minimizing duplication or re-invention. Organizations with a tradition of managing knowledge ensures faster innovation, improved customer service, reduced knowledge loss, productivity and better performance within the organization.

2.7.1 Approaches to Knowledge Management

Although there is a consensus on the importance of knowledge management, different countries have taken diverging directions during the early stages of their development (Demarest, 1997). European companies have been concerned with measuring knowledge, while the Americans have focused more on the management of knowledge, maximizing the use of information technologies (Reinhardt et al., 2011). The Japanese have centered their attention on creating new organizational knowledge from individual and group knowledge (Nonaka, 1991). Knowledge managers are responsible for the codification and storage of new knowledge in databases, as well as eliminating those that have become obsolete. They attempt to make these databases accessible to more employees and for them to be able to use them easily.

2.7.2 Basic Function of Information/Knowledge Information System

An information system has four main functions according to Alavi and Leidner (2001) namely: I. the input function- to capture and assemble the elements that enter the system to be processed, ii. Processing that is involved with transformational processes to convert inputs into outputs iii. Output that transfers transformed elements to their ultimate destination iv. Control and feedback- Feedback is data about the performance of a system while control involves monitoring and evaluating feedback to determine whether a system is moving toward the achievement of its goals. The control function then makes necessary adjustments to a system's input and processing components to ensure that it produces proper output (Callahan, 2018).

2.7.3 Components of an Information System

An information system (IS) comprises a hardware which is a computer and its accessories (Laudon & Jane, 2014). The second component of the IS comprise the software. These are programmes or applications that operate the computer systems. software is not tangible. But are computer instructions that can be used to manipulate the data (Kalle et al., 2016). Systems software includes the operating system and all the utilities that enable the computer to function (Leal, 2020). Software includes programs that do real work for users. For example, word processors, spreadsheets, and database management systems which fall under the category of applications software. The third important component of IS, is the database which refers to a collection of information organized in such a way that a computer program can quickly select desired pieces of data. Traditional databases are organized in fields, records, and files.

An alternative concept is Hypertext database, any object, whether it is a piece of text, a picture, or a film, can be linked to any other object. Hypertext databases are very useful for organizing large amounts of disparate information, but they are not designed for statistical analysis (Müller et al., 2019). A database management system (DBMS) is essential because it gives access to data entry, data organization and data selection. Telecommunications component of IS enables organizations to link computer systems into effective networks. Which entails data transmission, from voice to video. The network is yet another crucial component that helps to connect computers and computer equipment. to enable electronic communications (Lauder, 2020). The final component is the people and procedures: Müller argues that this is the most important element in most computer-based information systems and it includes people who manage, run, program, and maintain the system. Procedures - include the strategies, policies, methods, and rules.

2.7.4 Principles of Knowledge Management

In knowledge management there are certain principles that are crucial for considerations (Nielsen, 2007). First knowledge management is expensive (Choi, 2000). Knowledge is an asset, but its effective management requires investment of other assets like labour and capital (Danesh et al., 2012). The second principle states that effective knowledge management requires hybrid solution of people and technology (Goodluck, 2011). The third principle is that knowledge management is highly political (Callahan, 2018). If no politics appear around the knowledge management initiative, it is a good indication that the organization perceives that nothing valuable is taking place. The fourth principle is that knowledge management requires knowledge managers (Jackson & Williamson, 2011). These managers help to establish a knowledge-oriented technology infrastructure, and monitoring the use of knowledge (Brown & Duguid, 2001)

The fifth principle posits that in knowledge management benefits more from maps than models, more from markets than from hierarchies (Khalifa & Jamaluddin, 2012). This implies that, letting the knowledge market work, and simply providing mapping for the knowledge to consumers, seem to be more effective than organizing the knowledge in hierarchies (Basten et al., 2017). The sixth principle is a believe that sharing and using knowledge are often unnatural acts (Swan et al., 2002). To enter knowledge into a system and to seek out knowledge from others is not only threatening, but also just plain effort-so we have to be highly motivated to undertake such work (Nguyen et al., 2019).

Knowledge management means improving knowledge work processes like market research, product design and development, and even more transactional processes like order configuration and pricing (Basten et al., 2017). Knowledge access is only the beginning, but successful knowledge management also requires attention and engagement (Yazdani et al., 2011). Knowledge management never ends (Garfield, 2018) and it requires a knowledge contract (Danesh et al., 2012). Knowledge captured in a document would need to be managed (i.e., stored, retrieved, shared, changed, etc.) in a totally different way than that gathered over the years by an expert craftsman.

2.7.5 Use of ICT and Agricultural Knowledge Dissemination

Deployment of ICT in agriculture has been associated with positive impacts in many parts of the world. For example, China's agriculture sector has been transformed from traditional to modern practice through effective deployment of Information and Communication Technologies (ICTs) over the last three decades (Zhang et al., 2016). There are seven ICT based information dissemination models identified and used effectively in China to disseminate agricultural knowledge.

The Web Portal model, which is a collection of relevant web sites that form one stop centers for users usually farmers (Milovanović, 2014). The Voice-Based Service, another model, disseminates agricultural information through the use of telephone. There are established call centers that provide call serves to the farmers. The Text (SMS)-Based Service which relays messages to the farmers through Short Message Services (SMS) via mobile phones has been used to effectively relay farming messages to farmers. This service is normally jointly operated by agriculture sector and telecom service providers in China. Self-Support Online Community is yet another model where information services are provided by a community to its members. It is a membership-based system involving all stakeholders. Members share experiences and exchange information through interactive service platforms, Interactive Video Conferencing Service model uses online multimedia technology (Kuppuraj, 2020) to facilitate information service while Mobile Internet Based Service disseminates information through smart phone service, e.g., Agribusiness price information E-news. Lastly is the Unified Multi-Channel Service Model which utilizes multiple methods to effectively disseminate information through telephones, computers, and mobile phones.

In Kenya, the government has established an integrated and dynamic database for the agricultural sector and this has greatly improved access and use of Information. In addition,

there has been capacity building in ICT and packaging of user-friendly extension messages (Mureith et al., 2009) Attempts have been made to improve the reliability of agricultural information exchanged through farmer-to-farmer interaction and use of existing informal channels. The government is engaged in establishment of rural information centers and communities (Government of Kenya, 2012.)

2.8 Creating Effective Digital Content

The effectiveness of digital content is dependent on digital literacy of the target audience. According to Hinrichsen and Coombs (2014), digital literacy is the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills. Creation of digital content is one good way to manage knowledge which allows for easy searching and retrieval. Brown and Duguid (2001) posited that the techniques commonly employed in search of information include analytics which entails reporting tools, read data, process data, and format the data into structured reports that are delivered to users. In order to retrieve information queries, multi-dimensional analysis and reporting tools are employed. In addition, classification, estimation, affinity grouping or association rule, clustering, description and visualization are all techniques that are used in the search and retrieval of information and knowledge from a repository (Dalkir, 2013). This information may be useful to digital innovators who may want to use the search and retrieval of data techniques.

When designing a repository, it is important to choose a focus (Nielsen & Michailova, 2007). For example, one can make it possible to store all kinds of information which users find useful, or select a structure based on the focus and topic previously decided on. For a technical repository, solution descriptions, problems solved, dates released and authors are usually kept (Brownlee, 2009). For a general repository, the title, description, keywords, author and date information are usually maintained. One can also select to keep technical solutions including: newsgroup, database, and wiki, using groupware or a document management system (Lightstone et al., 2005). An important requirement for a repository is to allow users to comment on published experience notes. If users are allowed to rate the quality of the notes, this can be used both as feedback to authors, and for selecting high-quality notes in search (Pullin, 2012). Other requirements are to make a simple user interface and a simple process of submitting new experience notes. It is important to sustain and grow the repository by promoting it internally (Tiwana, 2000). The repository should be included in the

processes/daily activities. To achieve use over time, it is important that the repository is simple to use and that the process of submitting experience notes is not too bureaucratic (Lightstone et al., 2010).

According to Stanford University (2015), there are major issues that one has to consider in designing a digital content. These factors include; content organization, learning objectives, assessment, activities, content presentation, social presence and motivation and iterative design. The digital content has to be organized in such a way that it provides a seamless navigation (Blackmore et al., 2018). The learning objectives must be subjected to the Smart, Measurable, Achievable, Realistic and Time bound (SMART) criteria and a sound monitoring and evaluation framework developed. A lot of data is developed in the course of learning and one has to decide the best way to use this knowledge to improve the course developed (Barateiro et al., 2010).

The first step in developing digital content is to 1) Determine the purpose of the content: Specific types of content have specific purposes. Case studies, for example, demonstrate the organization's experience and expertise in specific areas (Stapleton, 2020). On the flip side, video content can be used to engage a different demographic through visual content that is both entertaining and educational. Determining the purpose at the very beginning of the content creation process improves the chances that the content will achieve the desired results; create useful, quality content: As referenced above, a rule of thumb in digital content creation is that every piece of content created must be useful and relevant to its target audience (Eileen-Mullan, 2011).

In addition to the usefulness of the content, there is a need to put a strong emphasis on creating high quality, professional content. 2). Promote content on social media: Sharing different content on each of the company's social media networks expands your brand's reach and adds scale to campaigns. The content you share on each site should preferably be unique, in order to give the followers incentive to follow on more than one network. According to Siu (2017), 85% of consumers want to see more video content from brands. Content like blog posts, for example, may have a lot of views, likes, and shares. This typically results in increased search engine rankings.3). Implement a Search Engine Optimization (SEO) program: Simply guessing keywords to use throughout some content hoping it resonates with some audience is likely going to lead to lackluster results. It is however, worth noting that some of the steps highlighted above may not be applicable to all types of content.

A University of Southern Mississippi professor, conceptualized the idea of digital composition as the ability to integrate multiple forms of communication technologies and research to create a better understanding of a topic (McKee-Waddell & Suzanne, 2015). Digital writing is a pedagogy being taught increasingly in universities. It is focused on the impact technology has had on various writing environments; it is not simply the process of using a computer to write. Educators in favor of digital writing argue that it is necessary because "technology fundamentally changes how writing is produced, delivered, and received" (Kalle et al., 2016). The goal of teaching digital writing is that students will increase their ability to produce a relevant, high-quality product.

One aspect of digital writing is the use of hypertext or LaTeX (Müller et al., 2019) as opposed to printed text, hypertext invites readers to explore information in a non-linear fashion. Hypertext consists of traditional text and hypertext that send readers to other texts. These links may refer to related terms or concepts or they may enable readers to choose the order in which they read. The process of digital writing requires the composer to make unique "decisions regarding linking and omission." The way the hyperlinks and are organized and used in a hypertext can be considered as a form of digital innovation.

2.9 Branding an Innovation as a Means to Overcome Resistance

According to Heidenreich and Handrich (2015), resistance to innovation is one of the key explanations to predict adoption-related behavior. However, lack of a good metric to assess consumers' predisposition to resist innovations has prevented the establishment of a common ground for empirical research and thus hampered progress to date. Yet a lot of resistance has been associated with integration of digital innovation (Kumar et al., 2022). This resistance could either be passive or active. Influencing factors of passive innovation resistance can be addressed by inclusion of a social dimension approach (Salawu et al., 2019). Whereas many studies have explained One way to overcome this challenge is treating the innovation like any new brand innovation where proper identification and branding of an innovation can go a long way reducing the resistance to innovation. Certain factors that result in late adoption of digital innovation including: negative word of mouth, global brand image consumer innovativeness and lead profile (Jahanmir & Cavadas, 2018).

Resistance and how to overcome it can be looked at from a German psychologist, Kurt Lewins) who viewed innovation as a form of change. Most innovations call for members who embrace it to change. Kurt lewin believed that peoples' behaviour is affected by forces in

their surrounding environment or field. He used the concepts of driving forces and restraining forces. Driving forces promote the change while restraining forces hinder the change. Attributes such as ambitions, goals, or fears drive people towards or away from something. The attributes can be considered as forces that can be exploited to introduce change and move the society in the desired direction. The restraining forces act to oppose driving forces. Force field analysis can be used to determine when the driving and restraining forces are not at equilibrium because this unbalancing creates an opportunity for change. The lengths of the arrows signify the magnitude of the forces and the longer the arrows the greater the force. A graphical representation of these forces can be used to assess whether a change is worth pursuing. The most optimal time to introduce change is when the two forces are not in balance. When the driving forces are greater than the restraining forces, the chances of introducing a change successfully are higher. The whole process can be classified into three stages of unfreezing, changing and freezing. The most stressful stage is unfreezing stage (Skepe, 2012).

There are many ways of branding innovations and one of them is by use of Logos. Logos are generally used to support and promote public identification and recognition (Dawar, 2018). It comes in many forms either abstract or a figurative design or it may include the text of the name it represents. At the level of mass communication and in common usage, a logo is today often synonymous with its trademark or brand (Alina, 2006). The design of logos and their integration in a graphic identity system can be difficult. There are three ways to categorize logos; pictographs are iconic, representational designs while logotypes (or wordmarks) depict the name or company initials (Rawsthorn, 2007). In most cases, logos are used to represent companies' brands or corporate identities and foster their immediate customer recognition, it is counterproductive to frequently redesign logos. A logo it is a point of recognition for clients and an important foundation for the branding. To form an opinion about an innovation or a company, Logos are used. A well-designed logo conveys positive messages to potential customers. That the business is professional, trustworthy, and endorse quality goods or services and thus advertise the innovation and enhance its acceptance.

2.10 Theoretical Framework

Four theories were selected to guide the design of the study namely; Experiential Learning Theory (ELT), Theory of Change, Diffusion of innovation Theory and Replacement, Amplification and Transformation (R A.T) theory. Experiential learning is related to the way meaning is made from an individual’s direct experience (Jordi, 2011). According to Kolb,

knowledge is continuously gained through both personal and environmental experiences (Kolb et al*.,* 2001). The tangible experience is described as hands on experience which is used to authenticate and examine abstract concepts. In addition, it provides important reference point for learning. The implications and validity of ideas created during the learning process" must be tested (Kolb, 1984).

There are four key abilities mentioned by Kolbs that anyone wishing to acquire genuine knowledge from experiences must possess. The learner must be willing to participate actively in the learning experience in addition to possessing abilities to make reflections from the learnt experience (Meyers, 2016) and ability to analyze the learning experiences. Decision making and problem-solving skills are also paramount in experiential learning in order to employ the novel concepts gained from the experience (Kolbs, 1983). Experiential learning model was originally postulated by psychologist David Kolb who emphasized how experiences influence the learning process. Kolb defined experiential learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the amalgamations of grasping and transforming the experience (Lewis & Williams, 1994). A process of learning can bring about "changes in judgment, feeling or skills" for the individual (Chickering, 1977), and can show a path for the "making of judgments as a guide to choose and take action. What is important in experiential learning is that the learner is stimulated to actively involve themselves in the experience and then to reflect on what is learnt using analytical skills" (Newbery-Jones, 2015). This is vital for one to gain an improved understanding of the novel knowledge and hold the information for an extended period time (Kolb, 2014).

The second theoretical basis of this study was the Theory of Change (TOC). Kurt Lewin, one of the earliest change thinkers, is still mentioned currently and his 'Three Step Change Model' has laid the fundamentals for contemporary day change theory (Bakari et al., 2017). The model was first suggested by Lewin's 1947 in his paper, "Frontier in Group Dynamics" (Lewin, 1947). The article evaluated how the behaviour of various groups determined the overall change process and performance. His main supposition was that effective change is realized through a three-step process; unfreezing, changing and freezing (Kaminski, 2011a). Most people prefer processes and strategies that they know than those they do not know (Clark & Taplin, 2012). According to Kurt Lewin, individuals were more likely to succeed if they used a variety of a variety of approaches to execute tasks other than those already known (Schein, 1996). He added that appealing to individual's emotional side gives the best chance

of success; this is what he termed as emotional stir up. Breaking down the status quo and pushing individuals out of the comfort zone may help individuals to acquire new skills (Smith, 2005).

According to Swanson and Creed (2014), it is crucial to conduct a Force Field analysis initially to assess whether the proposed change stands a chance of bringing out the desired changes.by weighting up the positive and the negatives of expected status quo. The Theory of Change must be coupled with indicators that guide and facilitate measurement (Cronshaw & McCulloch, 2008). Indicators may be said to operationalize the outcomes, that is, they make the outcomes understandable in concrete, observable and measurable terms (Earl et al., 2001). In this study, a force field analysis was conducted during the training of the students as they prepared to commence their attachment programme. During the same training efforts were made to unfreeze the status quo of FAP through appealing to emotions of the students to help them appreciate the necessary change in introducing a DKP contrary to the routine practice of FAP. Efforts were made to identify knowledge that according to Kolb's would enhance experiential learning among students on farm attachment.

Rogers's theory of Diffusion of Innovation was used in this study to guide in selection of participants who took part in the action phase of the study. According to Robertson (1967), The theory seeks to explain the rate at which new ideas or innovation are taken up by individuals attributing it to certain characteristic personalities. The theory suggests that one has to know the existence of an innovation before they can adopt it. This is followed by development of interest in that particular innovation. The person must then decide whether to uptake the new ideas or technology (Sanson-Fisher, 2004). There are four main rudiments that tend to influence the spread of a new idea: the innovation itself, communication channels, time, and a social system. Those who take up the innovations to implement it are classified on the basis of the speed at which adopt the innovations. The categories include: innovators, early adopters, early majority, late majority, and laggards (Lundblad, 2003). The condition for the adopter classification is innovativeness, explained as the rate of taking up new innovations. In this study, innovators were considered those students who showed interest in the DKP innovation idea.

In comparison to the theory of change, diffusion of Innovation takes a completely different approach majority of other theories of change. This theory focusses on change as being fundamentally about the evolution or "reinvention" of products and behaviour so they

become better fits for the needs of individuals and groups (Robinson, 2009). In Diffusion of Innovation, it is not people who change, but the innovations themselves. This is different from those propositions put forward by other change theorist who focus on persuading individuals to change. Five qualities determine the success of an innovation according to diffusion theorists: 1) Relative advantage suggesting that if an innovation is seeming better than existing idea it supersedes by a particular group of users, many people would be willing to take up the new innovation. This is only dependent on the particular perceptions and needs of the user group 2) Compatibility with existing customs and beliefs. If an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters. 3) Simplicity and ease of use. An innovation appears to be difficult to understand and use is not easily adopted 4) Trialability- An innovation that is easily experimented on and shows less uncertainty to the individual who is considering it is most likely going to be adopted. 5) Observable results whereby it is easier to adopt a technology if one has already seen the results of an innovation. A schematic diagram of the adoption of innovation theory is shown in Figure 1.

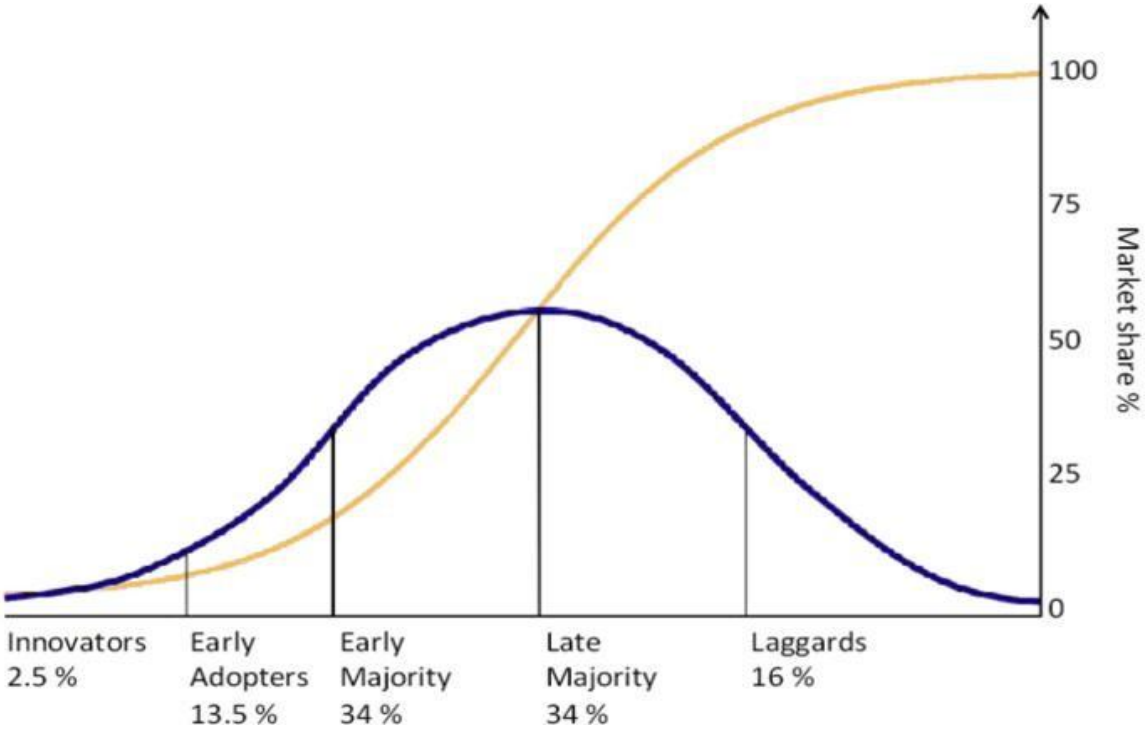


Figure 1. The Diffusion of Innovations Theory. Source: Rogers (1983)

Visible results lower uncertainty and also stimulate peer discussion of a new idea, as friends and neighbours of an adopter often request information about it. According to Everett Rogers, these five qualities determine between 49 and 87 percent of the variation in the adoption of

new products. These five qualities make a valuable checklist to frame focus group discussions or project evaluations. They can help identify weaknesses to be addressed when improving products or behaviour. Figure 2 shows these attributes that affect adoption of innovations. They include relative advantage of the attributes, complexity of the ideas the more complex the ideas are the lesser the adoption, Triability. It an idea is easy to try out, more people would be willing to try it out the opposite is also true. Observability; meaning that an idea that can be observed clearly will increase the chances of adoption. Finally, adoption of an attribute depends on compatibility with other existing ideas or innovations.

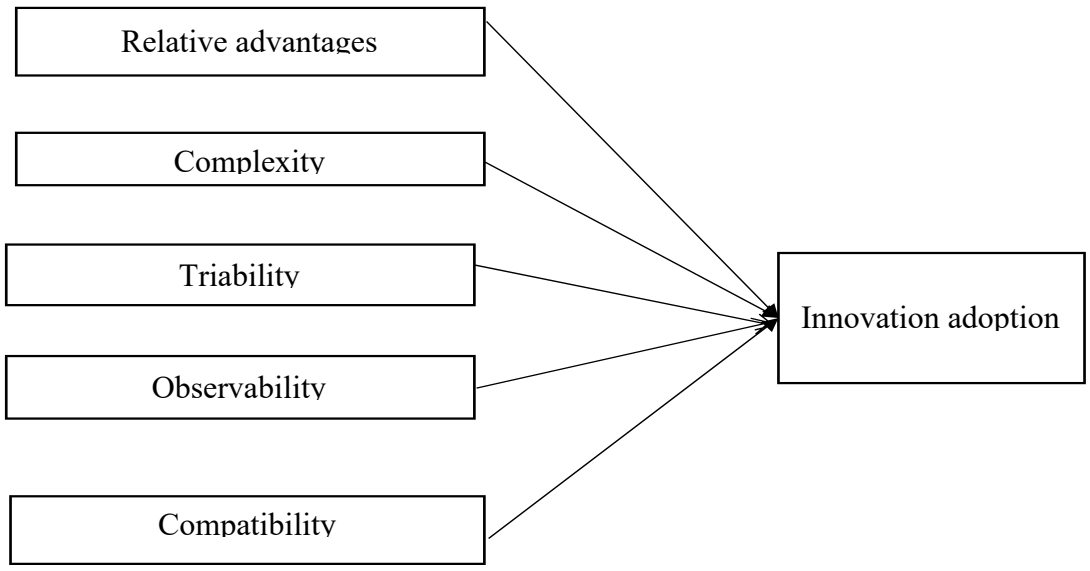


Figure 2. Factors affecting adoption of innovations Source: Tolba and Mourad (2011)

The final model that was used in this study was the Replacement, Amplification and Transformation (RAT) model. This model was most comprehensively described in Hughes and Scharber (2006). It is used to understand if digital technology innovated functions as replacement, amplification, or transformation in educational practice. In other words, the model helped to check first, if technology was used to replace and, in no way, changed

established instructional practices, student learning processes, or content goals and whether all that changes is the medium through which a well-established purpose was met. Secondly check if the technological innovation was used for Amplification-technology is meant to increase efficiency, effectiveness, and productivity of instructional practices, student learning processes, or content goals. The tasks stay fundamentally the same while the technology extends our capabilities in effectiveness or streamlining. Finally, the model was used to check if technology was used for Transformation. Technology reinvents aspects of instruction, learning, or curriculum in new and original ways. For example, new cognitive forms could emerge, new people could be involved, or new content may be accessible. Think of: alteration, change, conversion, revolution, renovation, makeover, restructure, reorganize. To assess a technology's contribution, one considers an instance of technology use and assesses it systematically in terms of three broad themes: instructional methods, student learning processes, and curriculum goals. Each of these three themes can be further articulated by identifying more specific dimensions of each. This study made sure that in introducing the DKP technology, other educational practices were not interfered with.

2.11 Conceptual Framework

The conceptual framework of this study is a reflection of Kolb's experiential learning model (Kolb, 1984), which emphasizes on possession of experiential learning abilities to maximize the benefits of learning experientially. The vulnerability context was the inadequacy of students' experiential learning abilities (ELAs).

Figure 3 is an illustration of the effects of DKP indicator variables on the student's experiential learning abilities. The figure also shows the moderator variables in the interaction as conceptualized in this study. The independent variables in the framework are the DKP innovation design attributes namely: DKP weekly structure, DKP student's portfolio, DKP knowledge resources and DKP implementation enablement. The figure shows the effects these variables have on the dependent variable, which is the experiential learn ability as indicated by improved willingness to actively participate in the farm activities that provide opportunities for EL, improved levels of reflecting on learnt experiences, improved ability to analyze learnt experiences, improved ability to solve problems and make decisions and finally improved ability to make continuity arrangements for initiated projects/innovations. The moderator variables are FAP design Attributes which were difficult to control and therefore, built into the study. These attributes were operationalized as: Student's attributes, Host farmer attributes and FAP structure and implementation attributes.

Figure 3 is the conceptual framework of the study showing the relationship between the Digital Knowledge Pack Innovation attributes and Experiential Learning Abilities among practicum students in Egerton University. The constructs used to measure the students' attributes indicators included; students' level of prior knowledge in agriculture, gender, study programme, academic department for the student, Faculty and student's year of attachment. Constructs for measuring host farmer attributes indicator were; Farmer's age, farmers' system of farming, Farmers' income levels and their level of education. The following constructs were used to measure the FAP structure, require. writing of quality field attachment reports, require already identified farm jobs, require jobsheet preparation, require matching students and host farmers, require analyzed jobs in the host farm and finally require analyzed tasks. The constructs to measure the implementation of the FAP included: making continuity arrangement, conducting job analysis, collection of farm data and analysis, conducting task analysis, reflections on learnt experiences, preparing job sheets and finally identification of host farm enterprises.

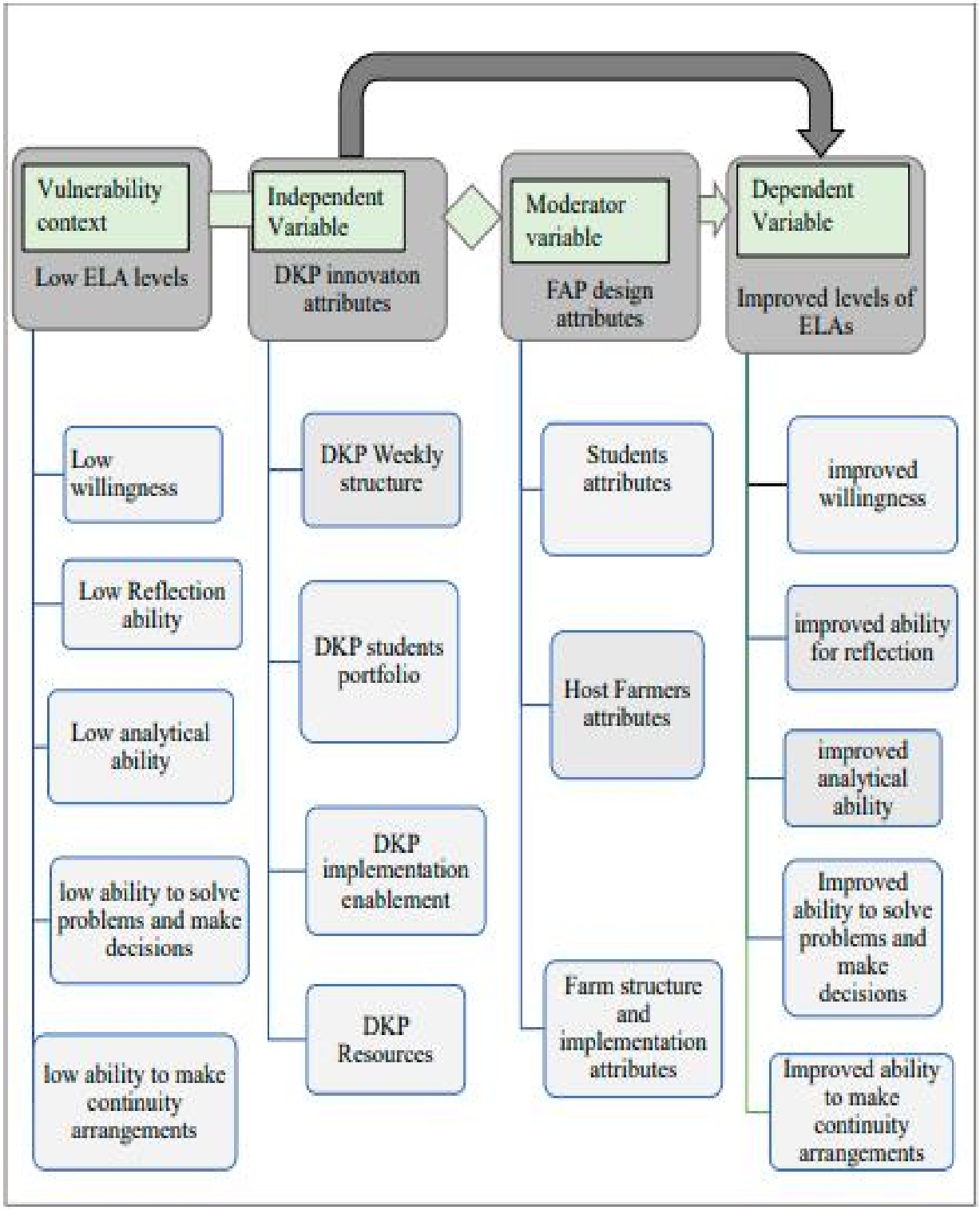


Figure 3. Conceptual Framework showing interactions of DKP innovation attributes with experiential learning ability indicators

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is a summary of the methodical approaches used to execute the research. In this study. In a nutshell the chapter begins with an introduction and goes on give an overview of how FAP is implemented at Egerton university. This followed by an explanation of the research approaches and methodologies adapted in this study to explain the research designs adopted in the study. FAP is implemented at Egerton university and goes on to explain how this study was organized around this establishment. A description of the study area has been given. The chapter also presents the target population, sample size, sampling procedures and instrumentation. An outline of instruments' validity and reliability determination has been given. The chapter ends with a description of procedures that were used to collect and analyze data.

3.2 Research Design

Participatory Action Research (PAR) approach with mixed designs and methods were used in this study. PAR is described as approach whereby the action investigator and the participant work together to diagnose a problem and in collaboration design a solution to the problem together (McIntyre, 2007). This differs from other research designs in which investigators' main focus is to reproduce research discoveries (Chevalier & Buckles, 2019). PAR is executed in four phases (Kemmis et al., 2013); diagnostic, planning, action and evaluation. Diagnostic phase helps to identify the research problem while in the planning phase, an intervention is designed to address the research problem. In the action phase the proposed intervention is implemented so that the in the final phase an evaluation is conducted to assess the effectiveness of the intervention in addressing the research problem. In this study, the phases of PAR were embedded around the establishment of FAP by Egerton University. Survey design was used in both the diagnostic and evaluation phases of this study.

Collection of data from a subset of a population through respondents replies to questions, is known as survey (Check & Schutt, 2012). Surveys are crucial in research because of their ability to allow description of characteristics of a population under study (Fraenkel & Wallen, 2000). Various tools including those designed to collect qualitative data are considered

appropriate for collecting survey data. This design is therefore common in socio sciences studies (Ponto, 2015).

Farm Attachment programme of Egerton University is designed such that students are attached to the same farm (s), continuously for at least three consecutive years. Each cohort of students builds on and follows-up on recommendations of the previous group. The first cohort of students focuses on making a general appraisal of the farm, i.e., identifying the strengths and weaknesses of the farm and making proposals for improvement (Mungai et al., 2016). In this study, the researcher participated actively in implementation of FAP for at least four cohorts from 2016 to 2019. The FAP model of Egerton university, is shown in Figure 4.

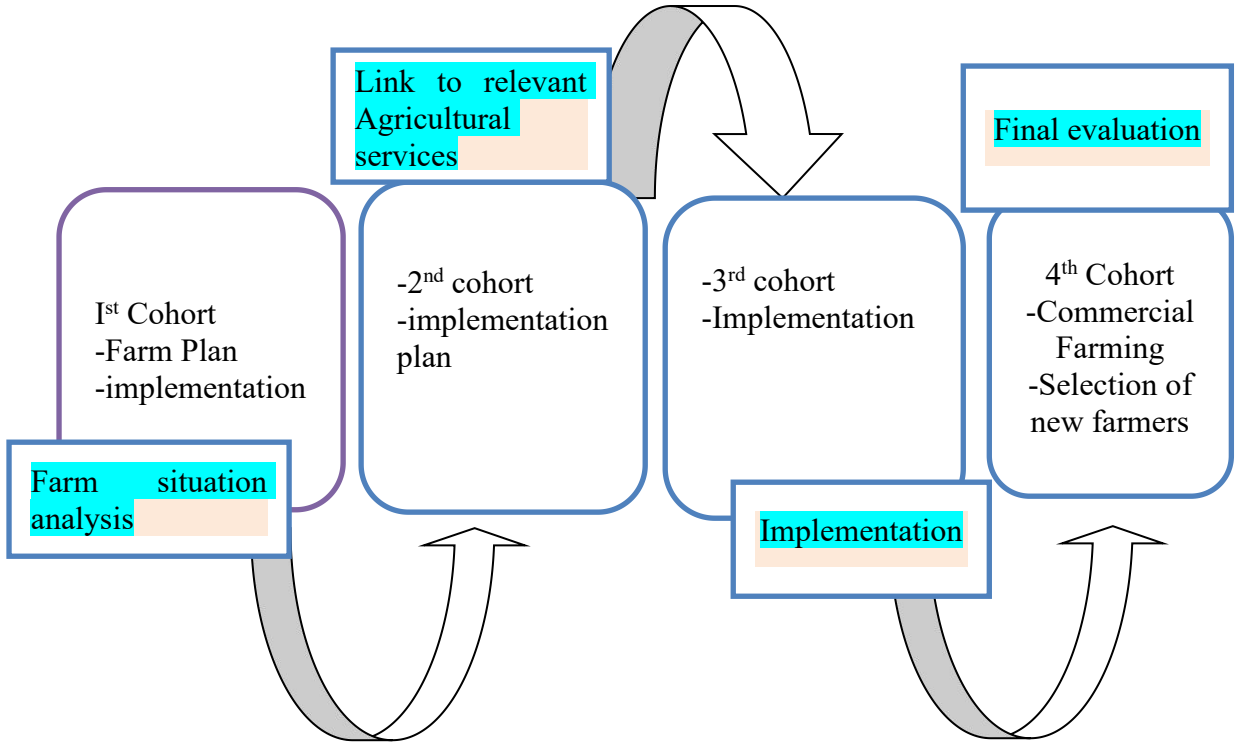


Figure 4. Egerton University Farm Attachment Model. Source: Mungai et al. (2016)

3.3 Location of the Study

The respondents in this study were students from Egerton university (see location of the university in the map shown in appendix J), located at Njoro sub-county in Nakuru County approximately 25 kilometers (16 mi), southwest of Nakuru town. Egerton university is approximately 182 kilometers (113 mi), by road, northwest of Nairobi, the capital and largest city in Kenya. The coordinates of the university main campus are:0°22'11.0"S, 35°55'58.0"E (Latitude: -0.369734; Longitude:35.932779). The Action phase of this study was conducted among the students hosted by farmers in Njoro ward (Walubengo, 2010).

3.4 Target Population

Two sets of populations were targeted. One, in the diagnostic phase of the study, of 600 students and their host farmers who had participated in FAP of Egerton University since the inception of the program in 2014. Th action phase of the research targeted 2019 cohort (one hundred students and their host farmers).

3.5 Sampling Procedure and Sample Size

Sampling of students hosted by farmers in Njoro ward allowed majority of the students to commute daily from their usual halls of residences and rental houses near Egerton University. The students were also able to access the university library. This aimed at reducing extraneous factors that would affect students' social realities and subsequently the study like paying higher rents for their accommodations. However, this was not possible for a few students who were either sheltered within the farmer's home premises or nearby shopping centers. Systematic random sampling on the basis of equal proportion was used to select 102 students, who had been on FAP of Egerton University between the years 2016 and 2019. The sampling frame was obtained from the Board of Undergraduate Studies (BUGs) of Egerton University. A total of 89 students participated in the online google groups set up for the baseline survey. Invitations to join the online google groups was extended to all students on FAP from the year 2015 to 2019. Members were purposively selected on the basis of their willingness to join and participate in the google groups. Those who willingly accepted the invitations and joined the groups were selected. Three online google groups were created namely; shambajuu internship group (15 members); Farmupinternship group (30 members) and farmtargetIsrael internship group (44members) giving a total of 89 participants from the google groups.

Extreme case procedure for sampling subjects from a population was employed to purposively select 30 students to take part in the action phase of the research. This was done following Diffusion of Innovation developed by E. M. Rogers in 1962. This theory talks about how individuals are able to adopt new ideas, skills and knowledge on technologies that emerge into systems (Miller 2015). According to this theory, adopters are categorized into four; innovators, early adopters, early majority, late majority and laggards. This theory categorizes people according to the rate at which individuals adopt a new idea (Lundblad, 2003). In this study, innovativeness among students was estimated by posting a message on students' whats app wall. The message indicated that indicating that there was going to be a

very exciting research activity in a week's time and those interested in participating should send their email addresses to me the researcher, as soon as possible. The first 30 students to send their email addresses were selected to participate in the study. Considering the short duration of FAP which is eight weeks, it was only possible to work with students who were quick to adopt the DKP innovation, in order to allow for the measuring of its effectiveness within the timeframe of the programme. Students who took longer than a week to respond and those who stated they needed payments before sending their email addresses, were not chosen.

A sample size of 30 students for the action phase of the research was considered appropriate. One of the determinants of the sample size is the variation within the study groups (Kothari, 2004). In this study, variation in terms of students' exposure to FAP attributes among the respondents was minimal and thus the justification of using 30 students which also ensures normality of the data. The study had planned to test the innovation in two cohorts. Owing to the sample that would sometimes fall below 30 subjects where students did not respond to some items, bootstrapping of 1000 samples was done using SPSS to ensure a normal distribution of the sample. Bootstrapping is a statistical procedure that resamples a single dataset to create many simulated samples. This process allows for calculation of standard errors, construct confidence intervals, and perform hypothesis testing for numerous types of sample statistics (Frost, 2018). The choice of 30 students was also necessary to avoid incurring huge costs in purchasing more than 30 digital toolkits for packaging the knowledge. The second determinant was level of confidence which was set at 95% giving margin error of 5%. Since this was a social science study, this margin was considered acceptable (Kathuri & Pals, 1999).

A tenth of the targeted population according to Kothari (2001), is considered adequate in estimating the sample size. To determine the size of a sample from a population of 600, the formula shown below was used. Where n is the estimated sample size, N= the target population. Substituting N= 600 the required sample size is as shown:

$$n = \frac{N}{10} = \frac{600}{10} = 60; n = 60$$

Which gave a sample size of 60 students for the baseline cross-sectional survey. However, to cater for non- response and to have enough respondent for every year represented in the survey, a sample size of 102 respondents was used. Purpose sampling was done targeting the innovative students in the action phase of this study to use the DKP innovation during FAP. In addition, one of the principles of Action Research is focusing on a small area (McIntyre,

2007).

3.6 Instrumentation

The study being a participatory action research called for collection of data in series starting with the baseline survey and ending with evaluation of the effectiveness of the digital knowledge pack innovation. The study used multiple instruments for the purpose of data collection because no single method is perfect in itself (Reason & Bradbury, 2008). Four data collection tools were used for the study.

Four instruments were used in data collection for this study namely; Online Google Groups Observation Proforma (OGGOP-Appendix A), Focus Group Discussion (FGDs) topic guide (Appendix B) semi-structured baseline questionnaire (Appendix C), and a DKP evaluation questionnaire (Appendix D).

The OGGOP was used to collect preliminary data on knowledge gaps within FAP that existed among Egerton University students. Students were asked to post their questions in the Question-and-Answer forum created in the online group. These questions were recorded in the OGGOP and later categorized into major agricultural knowledge areas. For instance, if students asked questions in livestock nutrition, dairy farming etc., these sub topic areas were grouped in one major knowledge area known as livestock knowledge area. The livestock knowledge area would then be considered as the variable to be measured and the sub topics areas i.e., Livestock nutrition, and dairy farming would be considered as constructs to measure the livestock variable. The students were requested to rate their level of knowledge in the selected constructs. The ratings were later compounded to calculate the overall rating of the major knowledge area e.g., livestock knowledge area.

The semi structured baseline questionnaire was used to collect data on some background information about the; students e.g., students' prior agricultural knowledge, study programmes, department, faculties and year of attachment; host farmers, e.g., level of education of the host farmer, his level of income, his age and his farming system. The next section of the questionnaire collected data on experiential learning abilities among students. Specifically; willingness to get actively involved in the learning experience, ability to reflect on learnt experiences, ability to analyze learning experiences; ability to solve problems and make decisions and finally ability to make continuity arrangements for initiated projects/innovations. According Fraenkel and Wallen (2000), questionnaires are ideal for a

survey because they are more economical and efficient. The FGD topic guide was used in the third week of attachment with the 2019 class. The students were supposed to narrate their farm experiences following the topic guides. The interview guides used to collect data in surveys are useful in collecting data for comparison purposes. Yin (2009), DKP evaluation questionnaire was the fourth instrument for data collection. the questionnaire provided the data that made it possible to evaluate the DKP variables namely; DKP weekly structure; DKP implementation enablement; DKP students' portfolio design and DKP knowledge resources.

3.6.1. Validity

Validity is the ability of an instrument to accurately assess that which it purports to measure (Fraenkel et al., 2011). Content validity on the other hand is the ability of an instrument to include a representative sample of the content to be assessed (Kathuri & Pals, 1993). Face validity refers the face value of the data collection instrument like the formatting and the length of the instrument. In this study, content, face and concurrent validity of the DKP were maintained subjecting the instruments to scrutiny by panels at departmental and faculty defenses. The instruments were later on revised based on the guidance obtained from the panelist for departmental and faculty defenses.

3.6.2 Reliability

The questionnaire that was used to collect data in the baseline survey was put through the reliability test in a pilot study. Twenty (20) students were requested to participate in this study that was undertaken in Rongai county, away from the location of the actual study, Njoro. Yin (2009), proposed an equivalent of 10- 20 percent of the sample size for a pilot study making a sample of 10 appropriate. The reliability of the survey questionnaire was estimated using Cronbach's Alpha reliability coefficient, which is a measure of internal consistency (Fraenkel & Wallen, 2000). The coefficient was calculated using GenStat statistical software. A reliability coefficient of 0.8 was obtained. According to Trochim (2006), any coefficient equal or above the threshold of0.7 for social studies is acceptable and shows the instrument in use is reliable (Yin, 2009).

3.7 Ethical Considerations

Ethical consideration was adhered to for safeguarding the anonymity of respondents during data collection. This was necessary because it encouraged the respondents to be honest. No respondent was forced to take part in the study. Because of the sensitive nature of the data

requested, total anonymity and confidentiality was guaranteed to the respondents. Permission to conduct this study among students on FAP was granted by BUGs of Egerton University. The researcher was introduced to the host farmers and to the students during all induction workshops and stakeholder meetings. Authority to conduct the research was sought and a research permit (see appendix H) was obtained from National Commission for Science, Technology and Innovation (NACOSTI).

3.8 Data Collection

The necessary approval from the Board of Postgraduate Studies of Egerton University, the National Commission for Science, Technology and Innovation (NACOSTI) and County ward administrators from Njoro, preceded data collection. An introductory letter was attached to the instruments to encourage participants to respond to items in the data collection instruments. Data were collected in all the phases of the PAR adopted in this study namely: Diagnosis, planning, action and evaluation.

3.8.1 Data collection for diagnosis of the problems in FAP

The diagnostic phase was carried out among students in 2016 through 2019 cohorts. It entailed collecting data using Focus Group Discussion (FGD), online google groups and a baseline questionnaire (appendix A) to identify the gaps in FAP. To ensure involvement of the participants in all the phases, workshops were organized where possible and Focus Group Discussions (FGDs) conducted to collect students' views. Figure 5 shows the students during the training workshop.

*Figure 5. S*tudents during the training workshop: photos by Kelvin Kamau 15/7/2019

During the training, the students were shown how to use the various sections of the DKP including: the DKP weekly structure, The DKP implementation enablement, The student's portfolio and the DKP resources. Figure 6 shows the students during FGDs.

Figure 6. Students during Focus Group Discussion: Photos by Kelvin Kamau on 15/7/2019

To identify the research gap in FAP four online google groups platforms in total were set up between 2015 through to 2019 namely; Shamba juu internship, farm up internship group and farm target Israel internship group and Digital Knowledge Pack group. The first three groups were set up before introduction of the DKP. The last google group platform known as DKP google group was meant to monitor the implementation of the DKP and offer feedback to students and researcher. It was also used as a platform for students to upload DKP documents from the student's portfolio. Any question asked was considered a topic area that students needed enhancement in. Figures 7 ,8 and 9 are screenshots of three of the online google groups that were created for data collection. In these platforms the students were encouraged to ask questions or raise any concern about FAP. The online groups were given different names: "Shambajuu" online google groups, the farm up internship group and the farm target Israel group respectively. Online google groups are free, simple to use and access online tools that can effectively be used by students. The tools were introduced to students during

induction workshops organized by Egerton University before the students proceed on FAP. An invite was sent out to all students on FAP to join the created google groups. Those students who accepted the invitation were automatically added to the group. The shambajuu online google group created in 2015 had 15 members out of a possible 50 members. The low membership was associated with low computer literacy levels at that time and poor internet connectivity in some rural areas where students were hosted.

Figure 7. Screenshot from shamba juu internship online FAP forum

The second google platform group, shown in 8 was given the name “Farm up internship group” which was created for the 2015 September FAP cohort. This group comprised 30 members who were active.

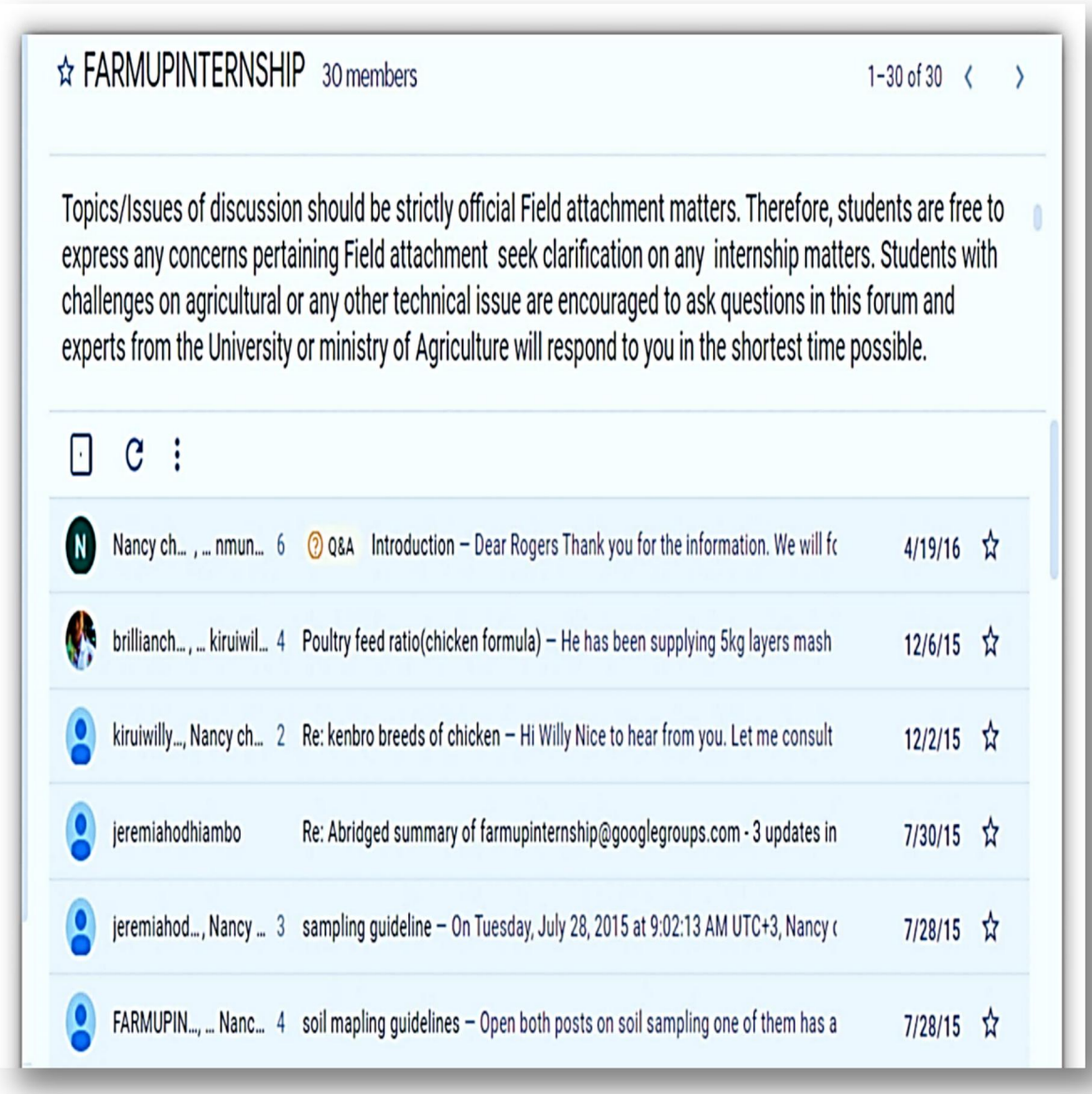


Figure 8. Screenshot on a conversation from google online group "farm up internship"

The third online google group was "farm Target Israel" google group (see Figure 8) which comprised 44 online members. This title was given to the group because most of the students were very eager to excel and get a chance to carry on with their farm attachment endeavors in Israel. Desire to travel to Israel was a limitation in data collection, most students tended to exaggerate the scores when rating variables. They reasoned that the high scores would give them an added advantage when it came to selecting students to travel to Israel, as was a routine in the FAP. However, a lot of triangulations was done by collecting similar data indirectly.

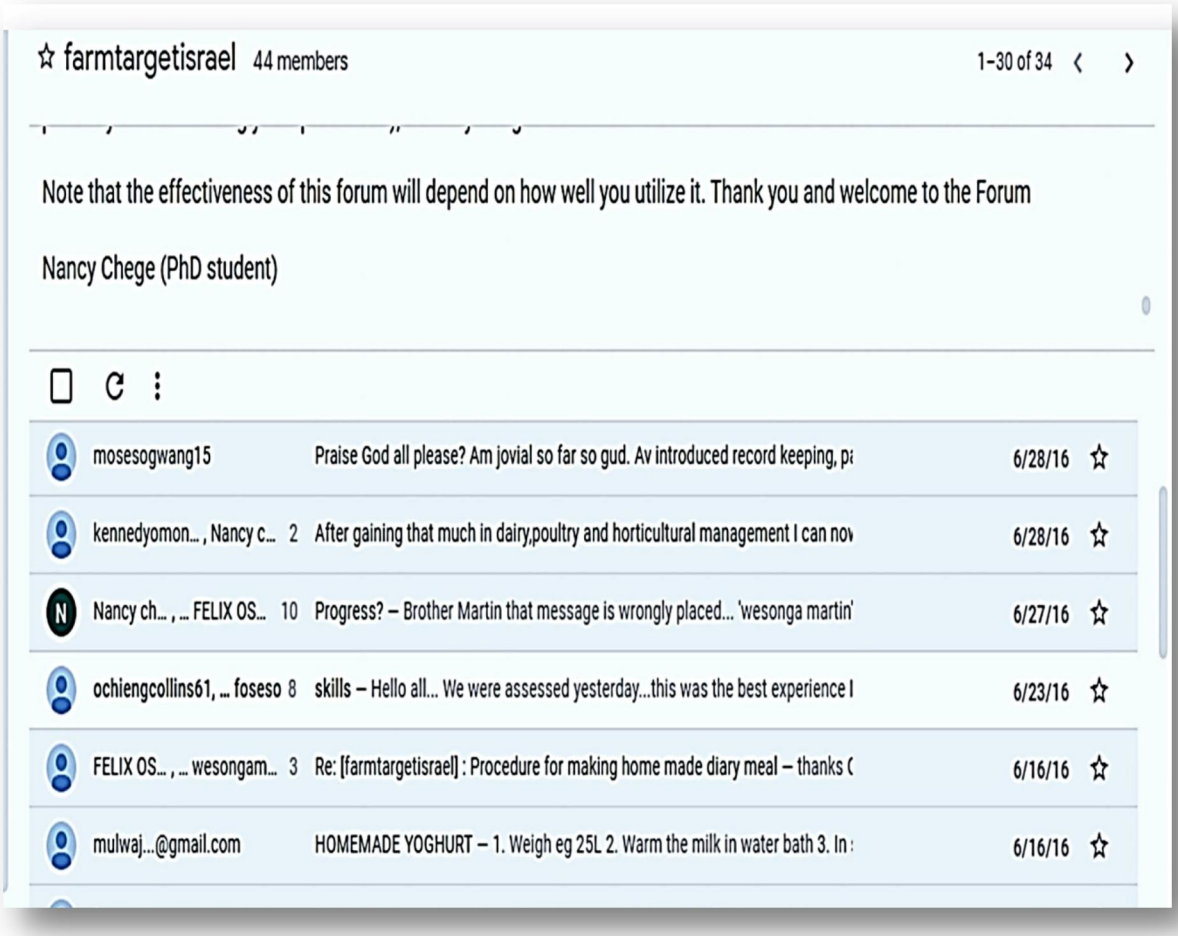


Figure 9. Screenshot from "farm Target Israel" online google group forum

3.8.2 Data collection for Designing the DKP innovation attributes

The planning phase was done in a participatory manner and data for effecting the innovation collected by organizing workshops for students. The researcher in collaboration with the students on FAP designed a DKP innovation as an intervention to address the gaps identified in the diagnostic phase of PAR. The major problem was that students lacked prompt, adequate, accurate and reliable agricultural knowledge during FAP. There was need to package carefully selected agricultural knowledge from baseline surveys and focus group discussion in addition to online google groups created for use by students during FAP. The content packaged targeted knowledge that would improve students' experiential learning including students'; willingness to be actively involved in the learning experiences; ability to reflect on learnt experiences; ability to analyze learnt experiences; ability to solve problems and make decisions and finally ability to make continuity arrangements for initiated projects in the host farms. The structuring of the knowledge in the DKP followed the theories of learning including but not limited to; organizing the learning materials in a logical sequence starting with the simple content and building it up to complex concepts, from known to

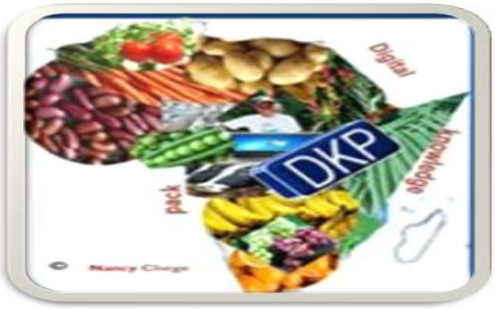
unknown, from concrete to abstract, using examples that were closer to students' environments in the farm as opposed to those found in far countries and from general to specific knowledge. The DKP was designed in such a way that it could work on mobile phones or computers. Initially it was assumed that the selected students would easily access the DKP via computers but it turned out that majority of the students had more access to smart phones as opposed to computers. The content of the DKP was repackaged in a folder and accessed by students via google drives in their smart phones. The following is a description of how data were collected to help in designing each of the DKP attributes starting with the DKP logo (see appendix I), login interface, overall basic structure, DKP weekly structure, DKP student's portfolio, DKP resources and DKP implementation enablement.

a. Data collection for designing the DKP Logo

To create an identity for the DKP innovation, a logo was designed and the students allowed to critique it. The logo (see appendix I) was supposed to depict a possibility of students' ability to improve their experiential learning ability levels and transform agricultural productivity using packaged knowledge in the DKP. Figure 10a. shows the draft logo that was presented to students for critiquing. The students were asked to brainstorm and critique the DKP logo that had been drafted by the researcher. The girl at the center of the logo shown in figure 10 was a symbol of the students on FAP of Egerton university.

The results of the in-depth brainstorming, were that, some students suggested a replacement of map of Africa with a map of Kenya. The students argued that there was need to see FAP based on a DKP, work in Kenya first before upscaling it to the continent of Africa. The other suggestion was to remove some crops in the draft logo, i.e., the beans, potatoes and tomatoes appearing in the map of Africa and to replace them with other crops like maize (Staple food), sunflower which is the crop for Mandera County of Kenya, water melon, they suggested should be included in the eastern part of the map of Kenya, cashew nuts in the coast region and wheat around Narok area. They suggested that gala goats be placed around the northern part of the map of Kenya and at the same time insert an image of the Friesian Breeds of dairy cattle since it was the most popular breeds in the farms hosting the students. This was an indication of development due to the breed's ability to produce high amounts milk. In addition, the students suggested an inclusion of Fish around the Lake Victoria basin and some mangoes around lake Turkana region. Figure 10b shows the final logo as designed collaboratively with the students.

THE LOGO



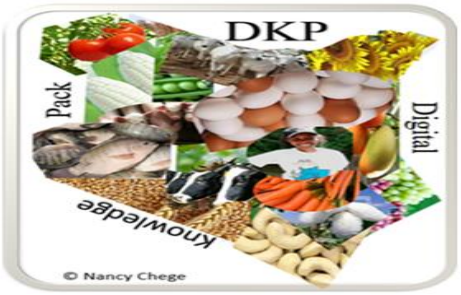


Figure 10a. Draft logo

Figure 10b. Final DKP logo

b. Data collection for designing a login interface

The students through Brainstorming agreed that it was important to limit access to the content in the DKP. They suggested use of a password to limit access. The login interface was designed to allow students on FAP to access the packaged knowledge. The students had to login using their university's registration numbers and a password provided by the researcher. Those students who were not participating in FAP could not access the content in the DKP. Figure 11 is a screenshot of the designed login interface.

Figure 11. The DKP login interface

c. Data collection procedures for structuring the DKP

The basic structure of the DKP was arrived at after brainstorming with the students. The students agreed that there was need to provide reference materials that were easily accessible during FAP to place bulky reference materials they had like text books, lecture notes and handouts that were recommended by the university. In addition, there were no weekly

guidelines to direct the students' activities. The situation was worsened by the fact that there was no real time follow up of the students during FAP. A decision was also made to structure the DKP in a way that it would provide some guidelines to direct the activities of the students on weekly basis and modify the logbook where students recorded their activities.

Finally, to take care of the follow up needed by students during FAP, an online google group was created where students would go online anytime they chose to ask questions or raise their concerns. The researcher would immediately respond to students concerns and direct them to resources including online resources to help students solve problems and make decisions. An online log book (students' portfolio) was created but modified to include sections that gave room to students to reflect on their learning experiences The findings from baseline survey analysis were used to help structure and implement, a Digital Knowledge Pack (DKP) innovation for use by students during FAP. According to Stanford University (2015), there are major issues that one has to consider in designing digital content. These factors include; content organization, learning objectives, assessment, activities, content presentation, social presence and motivation and iterative design.

The innovation targeted the enhancing of the FAP structure and implementation attributes and aimed at improving the students ELAs. In summary, the DKP had four sections, namely: DKP weekly structure, DKP student's portfolio, DKP resources and DKP implementation enablement. When designing the DKP innovation, efforts were made to structure it and implement it in a way that would improve the constructs associated with students ELAs including the willingness of the students to get actively involved in the learning experiences, make it easier for the students to reflect on learnt experiences, encouraging students to be more analytical by providing software in the DKP to enable students conduct analysis of learnt experiences, provide resources that would make it easier to solve problems and make decisions and at the same time encourage students to make continuity arrangements for initiated projects/innovations in the host farms. Figure 12 is a conceptual framework illustrating the design of the DKP and showing how the four sections were structured.

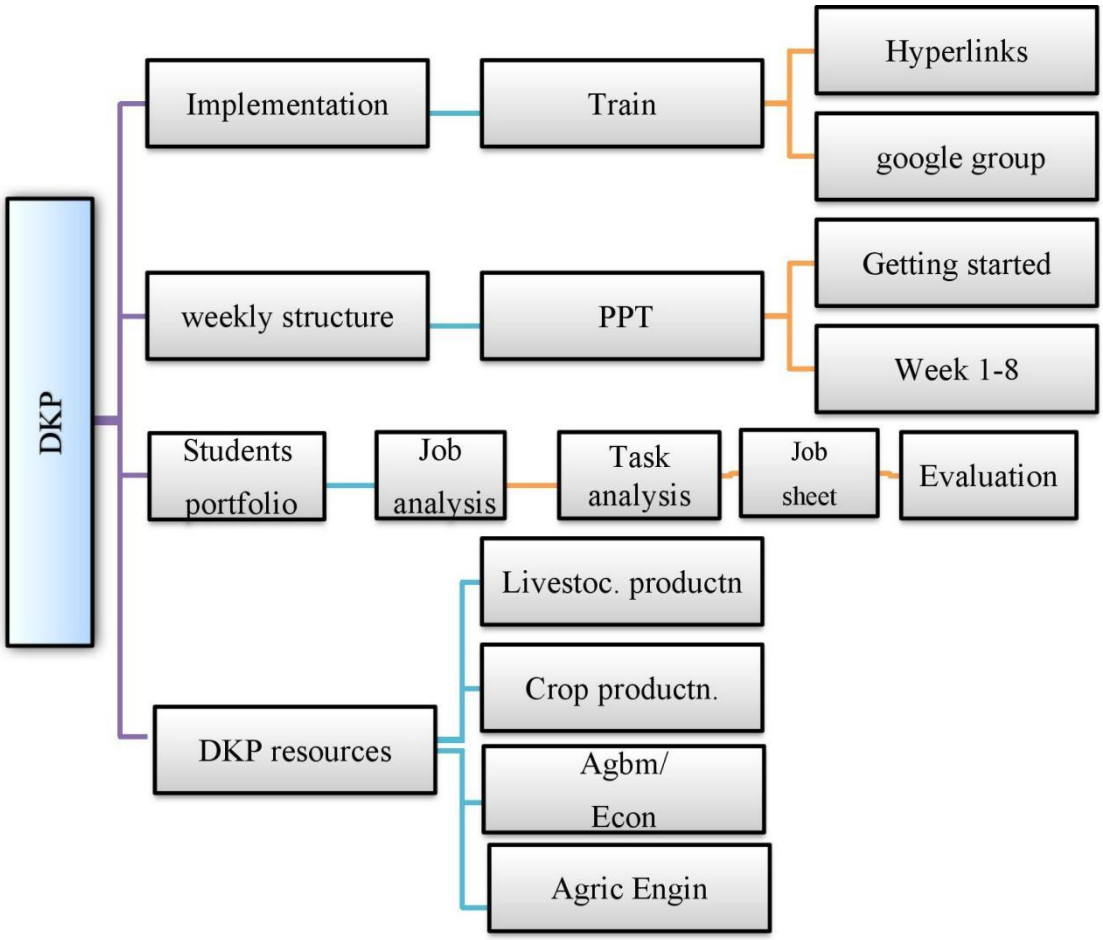


Figure 12. Basic design structure of the DKP

The following section describes the four components of the DKP in details.

d. DKP weekly structure design

DKP was structured in such a way that at the beginning of every week there was a power point presentation to motivate the students and prepare them for farm experiences to be undertaken in the course of the week. Figure 13 is a screenshot from the DKP weekly structure showing the first slide of week one presentations, the orientation week. Among the presentations made in week was also a short tutorial on how to use the DKP. This was important for the students who missed out on the training workshop or for some reasons did not understand how to use the DKP.

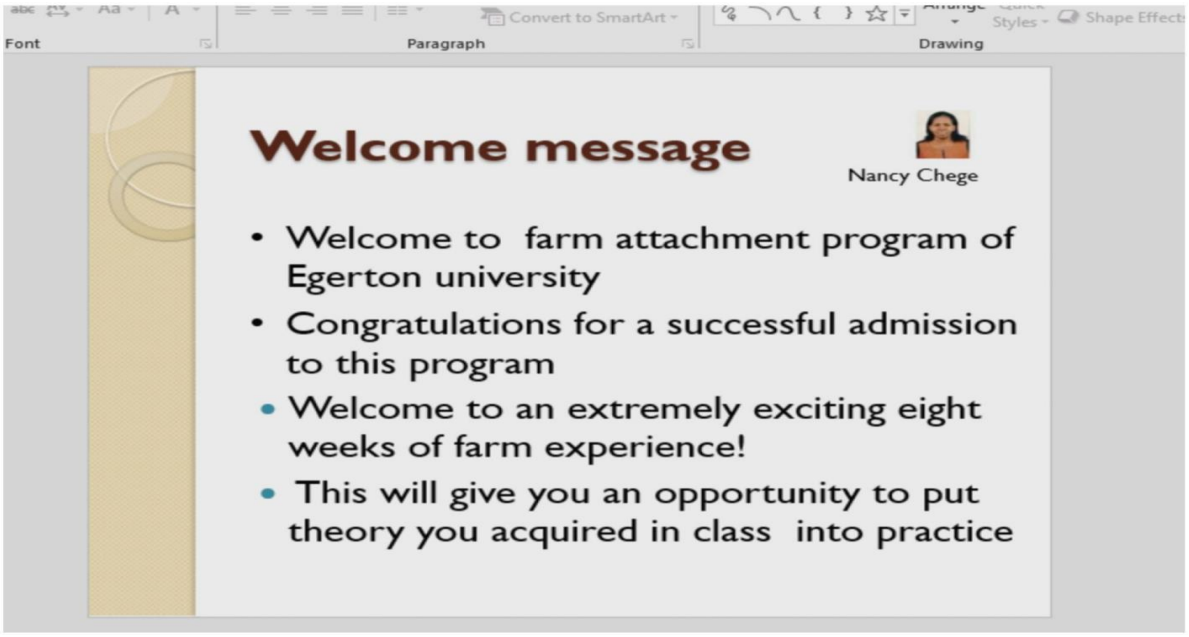


Figure 13. A screenshot from the DKP showing the welcome message page

A screenshot of the DKP weekly structure is shown on figure 14 which was a power point presentation. In the presentation, students were given an overview of the whole FAP from week one to week eight.

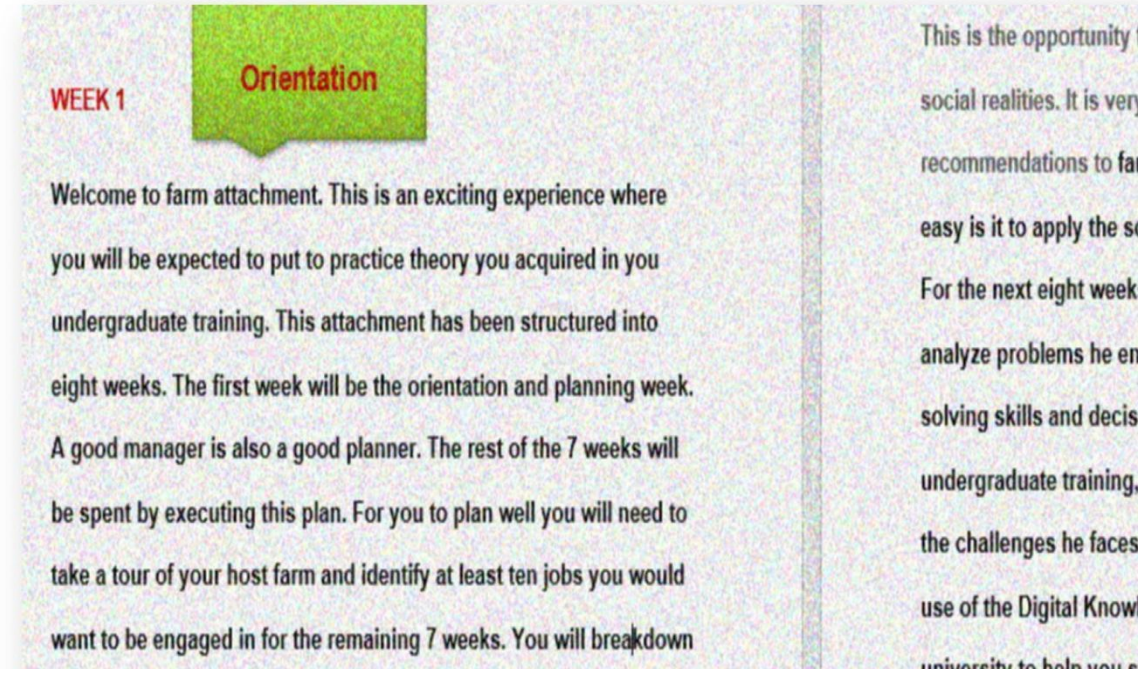


Figure 14. Screenshot of the DKP's week one orientation presentation

e. Designing the student's portfolio

In the student's portfolio, the students were required to record all their daily activities from week one to week eight. In week one, the students were supposed to take a farm tour with the

host farmers and record all the enterprises available in the host farm. Having identified the enterprises present in the farm, the student was supposed to conduct a job analysis and record this in the student portfolio. In other words, identify jobs that he was going to engage in on the farm. A digital page was created in the DKP toolkit where students would carry out the job analysis, task analysis, and reflect on their learning experiences. Figure 15 shows the content of the student's portfolio page.

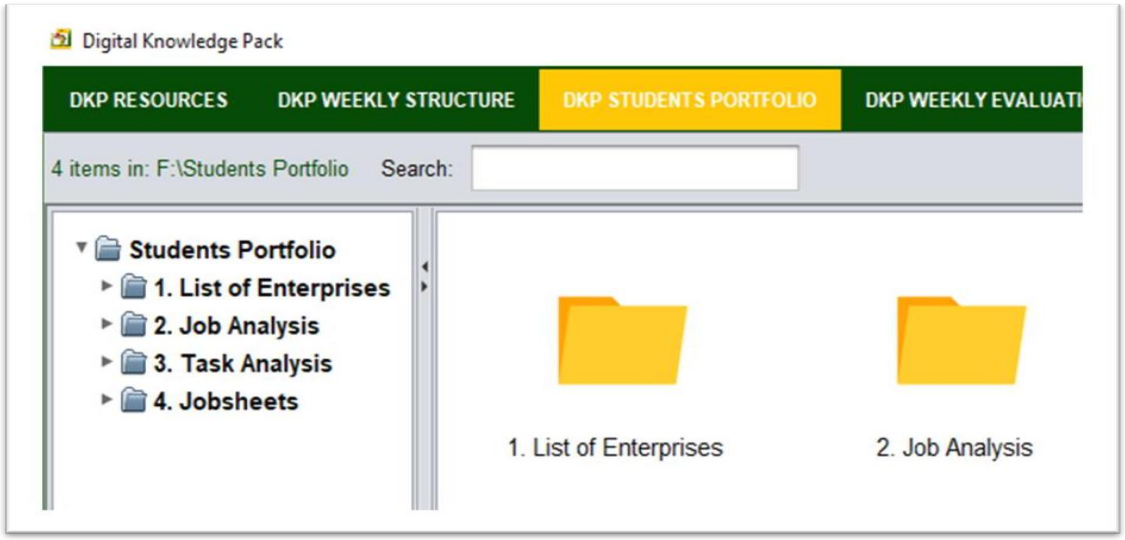


Figure 15. A screenshot of the student's portfolio section

f. Designing the DKP resource attribute

This attribute of the DKP was supposed to serve as source of agricultural knowledge to students. From the baseline survey, the four areas of knowledge found to be on demand by the students were: Livestock, crop, agribusiness/ agroeconomics and Agricultural engineering. Videos relating to these knowledge areas were uploaded in the resource section e.g., a video on milking procedure. From the baseline survey it was noted that students had problems identifying pests and diseases and were not confident in recommending appropriate pests and diseases control products, to their host farmers. In this regard, resources that allowed students to identify pests and diseases online were provided. With a click of a button, students would identify the pests or symptoms of crop and livestock disease and select products that would effectively control the diseases and pests. All the links to these digital resources were provided. Figure 16 is a screenshot showing some of the resources that were packaged to help the students identify pests and diseases in the host farms. The students were expected to help the farmers in diagnosis of diseases, identification of parasites and pests, and recommend a viable appropriate registered products to control the pests and diseases.

Figure 16. Screenshot of some of the knowledge resources packaged in the DKP

To facilitate learning, Educational Technology (commonly abbreviated as EdTech, or edtech) has been used (Mastellos et al.., 2018). In this study, digital technology was used to package resources to be used by students during FAP. The knowledge resources were put in four categories; the agribusiness resources, agricultural engineering resources, livestock production resources and crop production resources. Figure 17 shows a screenshot of the Resource section in the DKP.

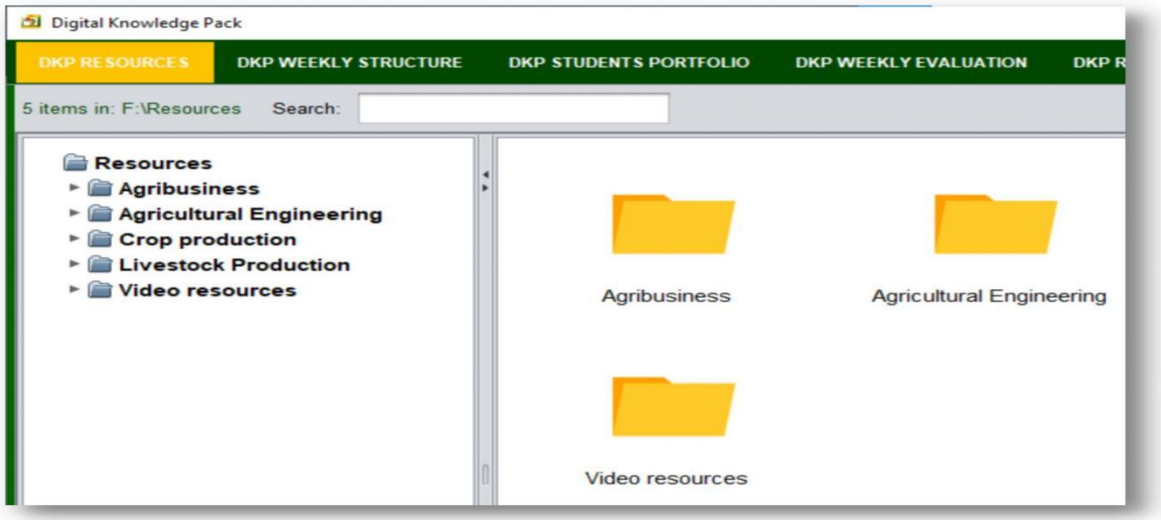


Figure 17. A Screenshot showing structured resource section of the DKP

There was a need to encourage students' analytical skills. To ensure that the students were equipped with tools to enable them carry out data analysis or other farm situational analysis, a statistical package known as INSTAT was installed in the DKP for use by the students. Figure 18 is a screenshot showing the spreadsheet area of the software that was uploaded. In addition to being free, INSTAT software is good at analyzing climate and weather data which are areas of major concern to agriculturalists.

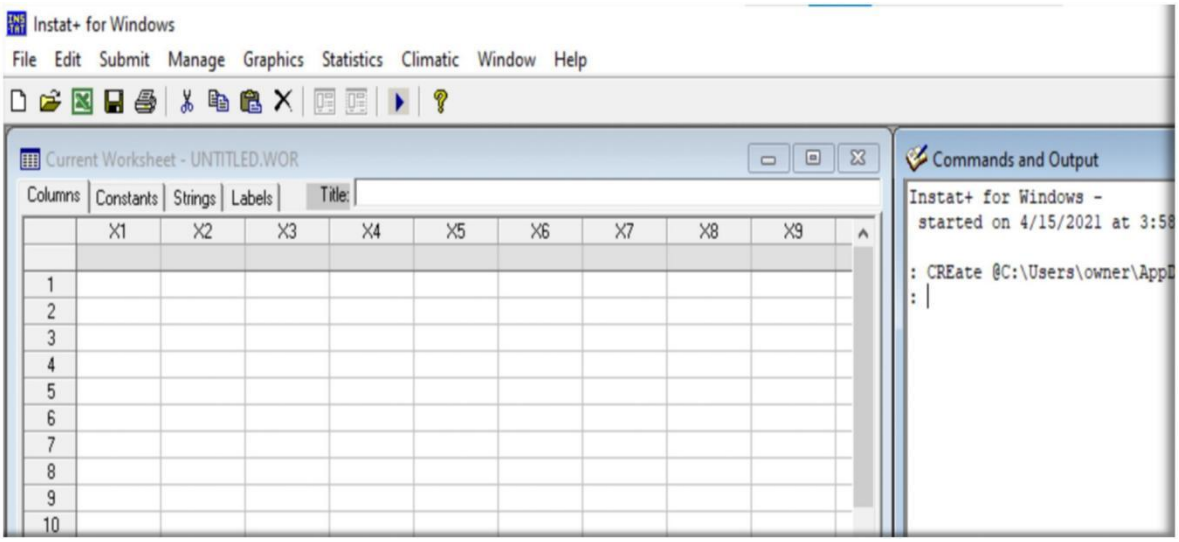


Figure 18. A screenshot of INSTAT, included in the DKP's resource section

In a study conducted to assess data analysis and measurement skills, students were observed to struggle in a variety of ways, specifically having difficulty (1) properly using certain measurement devices, (2) coordinating quantitative data with the phenomenon being measured, and (3) properly interpreting the significance of variation, uncertainty, and error in the data (Glancy et al., 2017). Provision of statistical packages in the DKP may have improved the data analytical skills among the students.

g. Designing DKP implementation enablement attribute

To facilitate the integration of the DKP into FAP, three implementation attributes were designed, namely; training workshops, online DKP google group and use of hyperlinks. The training workshop was designed to be conducted during the third week of FAP. It was assumed that by this time the students would have had some farm experiences and be in a position to suggest the kind of knowledge to be added and update DKP content. This would make the packaged knowledge relevant for every cohort that chose FAP. A DKP training manual was in cooperated within the DKP for future reference to any personnel that would be involved in preparation of DKP FAP students in future. One benefit of using the google

groups is that it connected the students online for real time interaction with the researcher whenever the need arose. Hyperlinks were used to facilitate navigation of content within the DKP. Hyperlinks send readers to other texts and may refer to related terms or concepts (such is the case on Wikipedia), or they may enable readers to choose the order in which they read.

3.8.3 Data collection for Designing Integration of the DKP into FAP

A group of 30 students were purposefully selected from the 2019 cohort to participate in the action phase of this study. The selection was based on student's innovativeness which was measured by how fast a student responded to activities posted in their what's app group per week. The first 30 students who responded to these activities, were chosen to participate in this study. The quick response was important as it gave hint to the kind of enthusiasm the student had in online and digital learning. In addition, the field attachment session lasted for only eight weeks and laggards in technology adoption were not likely to uptake the innovation within the short span of the FAP period. The action phase started with a workshop training to show students how to use the DKP during FAP.A training workshop was organized at Hanan guesthouse in Njoro, three weeks after commencement of the FAP. During the training students were taken through all the DKP attributes. The DKP was officially launched during the training workshop and participants in the study were required to start using the DKP in the fourth week and winding up in eighth week of FAP. Figure 19 shows students practicing how to prepare daily jobsheets and conduct task and job analysis.

Figure 19. A photograph showing students practicing how to prepare DKP documents. Photo taken by Kelvin Kamau on 18/8/2019.

3.8.4 Data collection for Evaluating the Effectiveness of the DKP

The Final phase of the study was evaluation phase. All the students in the 2019 cohort who had used the DKP innovation during FAP, participated in the evaluation phase of the study. Evaluation questionnaires were emailed to students and their responses collected online.

3.9 Data Analysis Procedure

Data analysis were conducted as per the research questions of the study as follows:

(i) *What design attributes characterize Farm Attachment Programme (FAP) of Egerton University and what areas can improve students' ELAs?*

The data for answering this question came from the baseline survey. The assessed FAP attributes included; Students, host farmers and FAP structure and implementation attributes. Statistical Package for Social Sciences (SPSS) version 21.0 was used in analysis of data. The whole process of data analysis started with data processing to ensure their validation, data editing to remove inconsistences like possible outliers in the data and finally, data coding was

done to help in tabulating data for subsequent analysis. Descriptive statistics including the means, medians, frequencies and percentages were used to describe the FAP attribute characteristics.

To characterize levels of ELAs, constructs of ELAs adopted from Kolbs (1984) including: willingness to be actively involved in the learning experience, abilities to reflect, analyze, solve problems and make decisions and for the purpose of this study ability to make continuity arrangement for initiated projects/innovations were measured on a rating on a 5-point continuum scale with a minimum score of one and a maximum score of five. The scores were further compounded to get the total score rating in the variable of interest for all the students and divided by a fifth to avoid working with large numbers. Categorization of the scores was later done as follows: 1-1.99=very low, 2-2.99=low, 3-3.99=moderate, 4-4.99= high and 5=excellent. Anything rated as excellent meant that the indicators of the study variables received the highest score of 5 from all the students and there was no need for enhancement. A score of 4.99 had a 0.001 chance of enhancement. One of the strategies of assessing students' abilities is by encouraging them to carry out a self-evaluation and/or group evaluation of a task performed (Moon, 2004). According to Kibwika (2006), it is important to give the individual student an opportunity to judge their own achievement as active participant of the assessment process by involving them in the feedback loop.

ii). *How are practicum student competencies (ELAs) affected by FAP attributes in Egerton University?*

To measure the effect of FAP design attributes on student practicum competences (ELAs), all categorical variables (Gender, academic programmes, year of attachment, farmers income levels) were first transformed into Dummy variables before running a general linear model. General linear model (GLM) was preferred because it displays partial eta squared in its output that can estimate the effect size of the FAP design attributes on students' practicum competences (ELAs). Box plots, line graphs and scatterplots were used to visualize the data graphically.

iii.) *How are the DKP innovation design attributes, integrated into FAP, affect ELAs among practicum students in Egerton University.*

Preliminary analysis of quantitative data was done using descriptive statistics. Measures of central tendencies particularly the mean were used. Frequency tables, bar charts, histograms, boxplots and pie charts were used for data exploration. General linear model (GLM) was used

to determine the effect size of the study variables. GLM was used because it gives an ANOVA and partial eta squared output which helps to estimate the size effects of variables

iv.) ***H_{01}***: *integrating a DKP Innovation into FAP has no statistically significant effect on ELAs among Egerton University students*

Considering that all the four DKP attributes including; DKP weekly structure, DKP implementation enablement, DKP student's portfolio and DKP resources, a Variance Inflation Factor (VIF) test was conducted to help detect any chance of multicollinearity in the independent variables. The results pointed to the need of performing a Principal Component Analysis (PCA) which produced a one component solution. The component is referred to in this study as DKP Innovation Design (DID) attribute. To evaluate the effectiveness of the DKP Innovation in improving students' ELAs, statistical modelling was done by running a linear regression. The following equations shows how the DID attribute index was computed using the DKP design attributes including; DKP weekly structure, (DWSi), DKP implementation enablement index (DIMi), DKP Students Portfolio Index (DSPi), and DKP Resource Index (DRi). The summation was divided by four (4) to avoid working with large numbers. In summary,

DIDi=$[\sum (DWSi + DIMi + DSPi + DRi)]^{1/4}$

Where DIDi = DKP Innovation Design index, DWSi= DKP Weekly Structure Design index DIM*i*=DKP Implementation Index

DSP*i*= DKP Students Portfolio index DR*i*= DKP Resources index

To determine the experiential learning ability index as a result of using the ELA $_{(After\ DKP)}$, variables suggested by Kolbs, (1984) were computed by compounding measured constructs for willingness index (Wi), Reflective index (R_i), Analytical index (A_i), Problem solving & decision-making index (PD_i) and Continuity Arrangement index (CA*i*). In summary;

ELA $_{(before\ DKP)}$=$[\sum (Wi + Ri + Ai + PDi + CAi)]^{1/5}$

ELA $_{(after\ DKP)}$=$[\sum (Wi + Ri + Ai + PDi + CAi)]^{1/5}$

Where;

ELA $_{(before\ DKP)}$=Experiential learning ability before integrating DKP into FAP

ELA $_{(after\ DKP)}$ = Experiential learning ability after integrating DKP into FAP

Wi = Willingness index

Ri = Reflective index

Ai= Analysis index

PDi = problem solving and Decision-making index

CAi = Continuity Arrangement index

To determine the extent to which the use of DKP innovation attribute improved the experiential learning abilities among the students, A two-sample *t*-test was carried out in order to compare the mean (before introduction of the DKP) and experiential learning ability (after introduction of the DKP). The null hypothesis was that the true difference between the means for the two experiential learning ability indices was zero, i.e., we were testing:

$H_0 : ELA\ (_{after\ DKP}) - ELA(_{before\ DKP}) = 0$

against $H_A : ELA\ _{(after\ DKP)} - ELA(_{Before\ FAP}) \neq 0$

Table 2 gives a summary of the research questions targeted, the independent variables, dependent variables and suggested statistical analysis expected to be used in the analysis.

Table 2

Data Analysis Summary

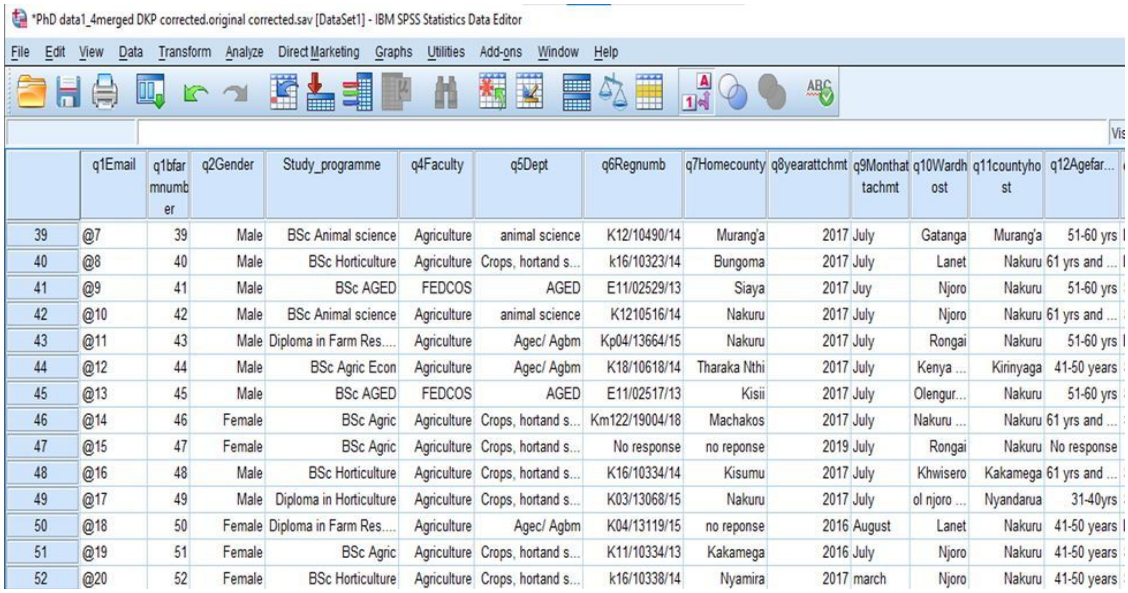
Research Question	**Independent Variable**	**Dependent Variable**	**Statistical Analysis/graphical tools**
1. What design attributes characterize Farm Attachment Programme (FAP) of Egerton University and what attributes can improve students' ELAs?	i. Students' attributes ii. Farmers' attributes iii. Programme structure and implementation characteristics	Students' ELAs	Textual data analysis Means Frequencies Pie charts Bar graphs
2. What are the effects of FAP design attributes on practicum student competencies (ELAs) in Egerton University?	FAP design attributes	Students' ELAs	Variable transformation General linear model ANOVA Multiple regression
3. How do DKP innovation design attributes integrated into FAP affect ELAs among practicum students in Egerton University?	DKP design attributes	Students' ELAs	GLM ANOVA Multiple linear regression
4. $\mathbf{H_{01}}$: integrating a DKP Innovation into FAP has no statistically significant effect on ELA among Egerton University students	FAP design attribute DKP design attribute DID design attribute	Students' ELAs	PCA ANOVA MLR

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

I The purpose of this study was to quantify Egerton University's students' levels of experiential learning abilities and if found to be low, design an intervention that would eventually improve the levels of ELAs. A Digital Knowledge Pack (DKP), which may be viewed as a FAP Knowledge Management System (FKMS) was innovated to address the challenges in FAP. This chapter presents the results and discussions of the study as per the following objectives; To i) characterize the design attributes of Farm Attachment Programme (FAP) of Egerton University and show areas of improvement. ii) assess how practicum student competencies (ELAs) are affected by FAP attributes in Egerton University iii) explore how DKP innovation design attributes integrated into FAP affect ELAs among practicum students in Egerton University and iv) Determine the extent to which the DKP Innovation integrated into FAP improves ELA among Egerton University students. The dataset in the baseline survey comprised 102 and 30 participants in the baseline and action phase respectively. Figure 20 shows a screenshot of the dataset



	q1Email	q1bfarmnumber	q2Gender	Study_programme	q4Faculty	q5Dept	q6Regnumb	q7Homecounty	q8yearattchmt	q9Monthattachmt	q10Wardhost	q11countyhost	q12Agefar...
39	@7	39	Male	BSc Animal science	Agriculture	animal science	K12/10490/14	Murang'a	2017	July	Gatanga	Murang'a	51-60 yrs
40	@8	40	Male	BSc Horticulture	Agriculture	Crops, hortand s...	k16/10323/14	Bungoma	2017	July	Lanet	Nakuru	61 yrs and ...
41	@9	41	Male	BSc AGED	FEDCOS	AGED	E11/02529/13	Siaya	2017	Juy	Njoro	Nakuru	51-60 yrs
42	@10	42	Male	BSc Animal science	Agriculture	animal science	K1210516/14	Nakuru	2017	July	Njoro	Nakuru	61 yrs and ...
43	@11	43	Male	Diploma in Farm Res....	Agriculture	Agec/ Agbm	Kp04/13664/15	Nakuru	2017	July	Rongai	Nakuru	51-60 yrs
44	@12	44	Male	BSc Agric Econ	Agriculture	Agec/ Agbm	K18/10618/14	Tharaka Nthi	2017	July	Kenya ...	Kirinyaga	41-50 years
45	@13	45	Male	BSc AGED	FEDCOS	AGED	E11/02517/13	Kisii	2017	July	Olengur...	Nakuru	51-60 yrs
46	@14	46	Female	BSc Agric	Agriculture	Crops, hortand s...	Km122/19004/18	Machakos	2017	July	Nakuru ...	Nakuru	61 yrs and ...
47	@15	47	Female	BSc Agric	Agriculture	Crops, hortand s...	No response	no reponse	2019	July	Rongai	Nakuru	No response
48	@16	48	Male	BSc Horticulture	Agriculture	Crops, hortand s...	K16/10334/14	Kisumu	2017	July	Khwisero	Kakamega	61 yrs and ...
49	@17	49	Male	Diploma in Horticulture	Agriculture	Crops, hortand s...	K03/13068/15	Nakuru	2017	July	ol njoro ...	Nyandarua	31-40yrs
50	@18	50	Female	Diploma in Farm Res....	Agriculture	Agec/ Agbm	K04/13119/15	no reponse	2016	August	Lanet	Nakuru	41-50 years
51	@19	51	Female	BSc Agric	Agriculture	Crops, hortand s...	K11/10334/13	Kakamega	2016	July	Njoro	Nakuru	41-50 years
52	@20	52	Female	BSc Horticulture	Agriculture	Crops, hortand s...	k16/10338/14	Nyamira	2017	march	Njoro	Nakuru	41-50 years

Figure 20. A screenshot of the dataset

4.2 Characteristics of FAP design attributes

The first objective of the study was:

To characterize the design attributes of Farm Attachment Programme (FAP) of Egerton University to show areas of improvement.

The assessment of the FAP design attributes was done by making preliminary observations

from online google groups set up from 2015 to 2019. A baseline survey questionnaire was also used to collect targeted additional data to characterize the FAP attributes. Three FAP design attributes were found to be relevant to this study including; Host farmers attributes, students' attributes, and FAP structure and implementation attributes.

4.2.1 Characteristics of the host farmer attributes

The attributes that were studied include; types of major enterprises in the host farm, the farmer's; age, education level, the level of income and the farming system (whether large scale of small-scale farming). These data were collected from 102 students who participated in the baseline survey.

a. Types of the enterprises in the host farms

Types of enterprises in the host farms pointed to the kind of knowledge required by students during FAP. The results of the baseline analysis revealed that the farmers hosting students on FAP were engaged in both livestock and crop enterprises. The percentage distribution of the enterprises among the farmers is described in the following section.

A frequency distribution represented graphically by the bar chart in figure 21 shows that the farmers were engaged in livestock enterprises including; dairy farming, poultry farming, shoats farming, fish farming and pig farming. Eighty-five (85.3%) percent of the host farmers reared dairy animals. Some (52.9%) reared poultry while 47.1% reared sheep and goats, 3% of the host farmers practiced fish farming and only a small percentage of host farmers reared pigs.

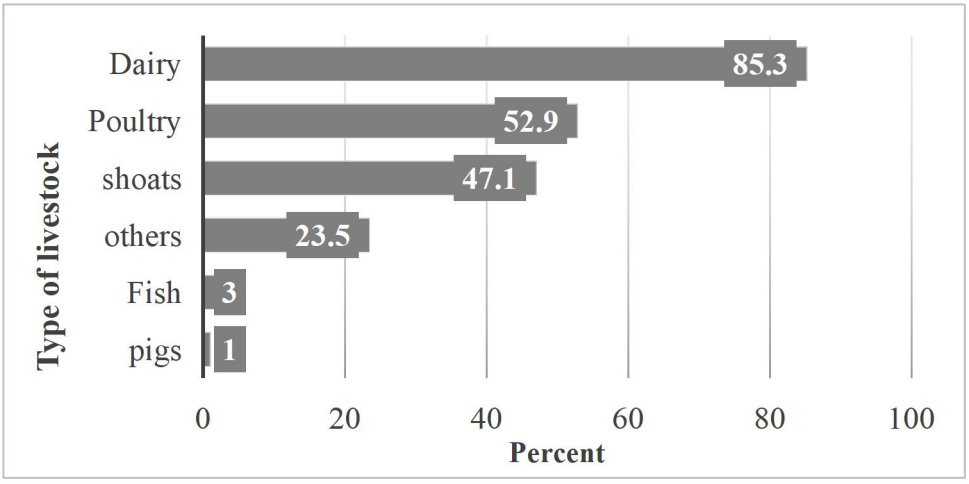


Figure 21. Percentage distribution of livestock animals among the host farms (n= 102)

Different breeds of animals require different knowledge in management practices and it was

important to survey the types of livestock breeds kept by most farmers. Figure 22 shows the percentage distribution of dairy cattle breeds in FAP. Majority (72.5%) of the farmers reared the Friesian breed of dairy cows. Some (33.3%) of the host farmers specialized in rearing crossbreeds. A small percentage (11.8%) kept the Guernsey breed and another 11.8% kept the jersey breed. These results showed that there was a very high probability (p= .85) that students on FAP would engage themselves in dairy farming. There was need to ensure that students had adequate knowledge in management of exotic breeds of dairy cattle. The management practices of the Friesian breed in particular was important. The probability (p=.725) of engaging in the management of Friesian breed in Particular was high.

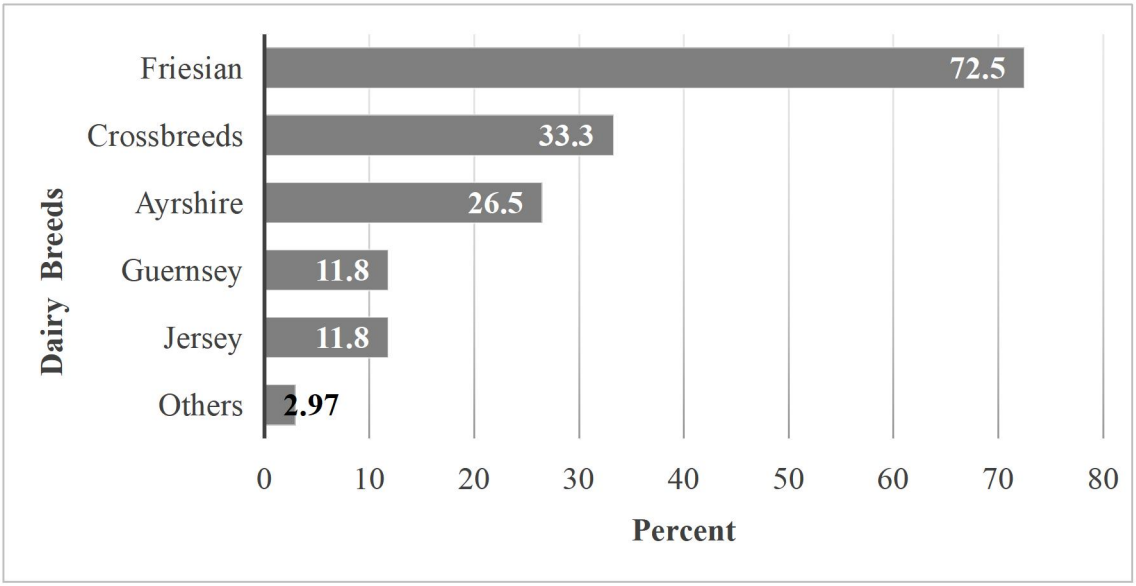


Figure 22. Percentage distribution of dairy breeds

A further analysis was conducted to determine the type of poultry breeds reared by the host farmers. The results showed that majority (49.2%) of the farmers kept the indigenous breeds of poultry. This is contrary to the content covered in the university curriculum that puts more emphasis on exotic breeds of poultry as opposed to indigenous breeds (Egerton university, 2014). The percentage distribution of the types of poultry breeds reared by farmers is shown in figure 23. A small percentage (8.8%) of the host framers in FAP reared the broiler breeds of poultry. It can be argued therefore that majority of the students were likely to rate their knowledge in poultry as high including those who were not enrolled in animal related study programmes. Most students were probably engaged in producing indigenous breeds of poultry in their own homes and did not rely on technical knowledge taught at the university to manage the indigenous poultry breeds. The layers breeds were kept by only a small (17.6%)

percentage of the host farmers. Some (32.4%) farmers kept other types of poultry breeds that were not specified.

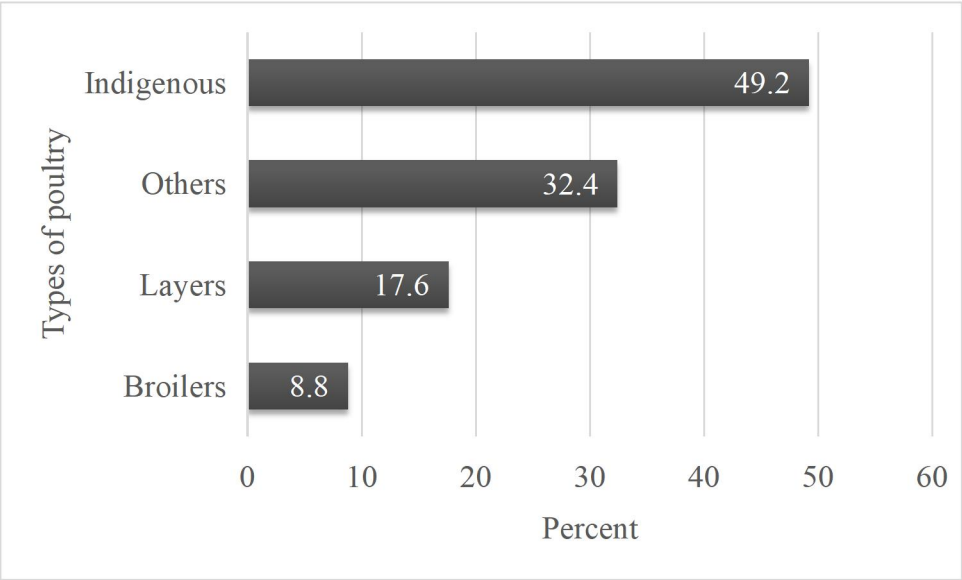


Figure 23. Percentage distribution of types of poultry reared by host farmers

The picture of guinea fowl shown in Figure 24 is an example of other types of birds that were domesticated by some host farmers. This photo was taken from Roho Safi farm in Njoro sub-county.

Figure 24. Photo showing guinea fowls birds kept by some host farmers.

To survey the crop enterprises, students were asked to mention the crops found in their host farms. The crops grown were put in two groups; i) those that were grown by more than10% of the host farmers and ii) those that were grown by a small percentage of farmers (less than 10%). The results revealed that majority (69.6%) of the host farmers were engaged in maize farming, 52% in cabbage farming while 10% were engaged in farming of carrots. The students therefore needed knowledge in management of listed crops particularly: maize, cabbages, beans, onion, kales, Irish potatoes, barley, garden peas and carrot. The percentage

distribution of other crops grown by the farmers are shown in Figure 25.

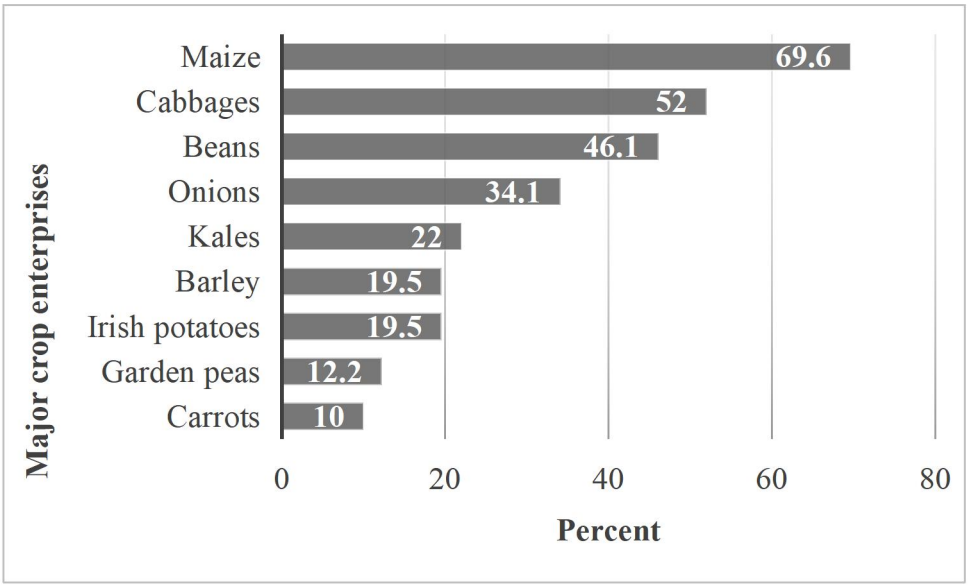


Figure 25. Percentage distribution of major crops grown by host farmers

The crops that were grown by less than 10% of the host farmers are shown in Figure 26. The crops included: tomatoes, Boma Rhodes, spinach, passion fruits, Napier grass, sunflower, wheat, rape seeds, water melon, pyrethrum, roses, oil crops and apples. Since only a small percentage of the farmers were involved in the production of these crops, students demand for the management practices of these crops was not as high and it was possible to provide the knowledge on request during FAP. Therefore, knowledge in these crop areas was not packaged in the DKP innovation but was provided on demand by the students.

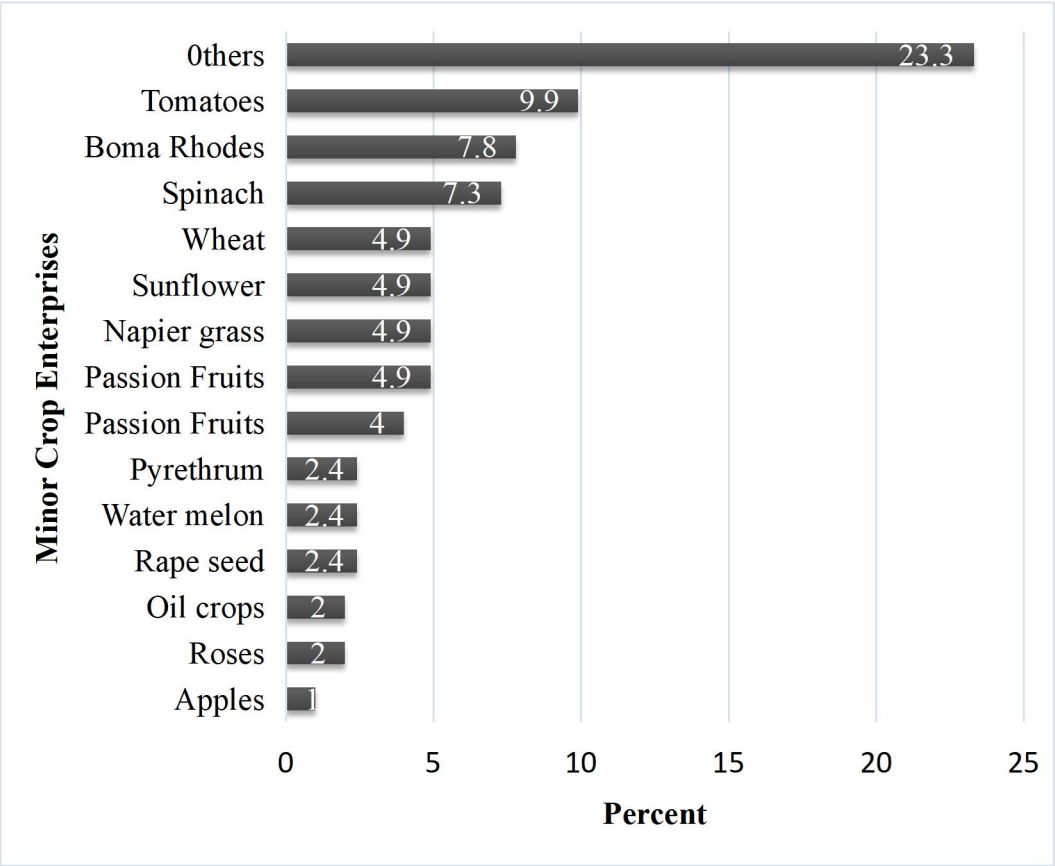


Figure 26. Percentage distribution of crops grown by less than 10% of the host farmers in FAP

b. The age of the host farmer

Students were asked to state the ages of their host farmers. The results of the percentage distribution of the farmers according to their ages shown in Table 3, reveal that majority (32.4%) of the host farmers were aged between 41 to 50 years. Those that were aged between 51 to 60 years, made up 28.4% of the respondents. Those aged above 61 years and above, comprised 25.5% of the host farmers population. Only 6.9% of the farmers were aged between 21 to 30 years. Farmers that were between 31 to 40 years made up 8.8% of the total population of the host farmers in FAP. It was important to find out whether there was a statistically significant difference in experiential learning ability among students hosted by farmers of different ages. Research has shown that as the farmer ages and gains experience, he or she may become more productive with improved managerial ability and that productivity may fall later in life. Articles concentrating only on farmer's age and productivity include Tauer (1984), who estimated a production function by age group and derived marginal products of various inputs. He concluded that the overall productivity of the farmer was greatest at the age group of 35 to 45 years. However, this was later revisited and a study

conducted to determine the effect of farmer's age on farm productivity showed that the life cycle may have become muted with time such that the older farmers were almost as productive as the younger farmers (Fried & Tauer, 2016). It is clear that there still exists a productivity life cycle in agriculture, such that the productivity of the average farmer first increases with age and then decreases. However, the increase in productivity is only about 5 percent greater at mid-life compared to farmers under the age of 25, and only decreases one percent at age 55 to 64. Unfortunately, the productivity falls to 11 percent for those farmers over the age of 65 years (Fried & Tauer, 2016).

c. Educational Level of the Host Farmer

Majority (46.1%) of the host farmers in FAP, had university education. Only a small percentage of 6.9% had primary education. Another 6.9% had other education levels which the students did not specify. The rest of the farmers had their highest level of education as indicated in Table 3. Educational level has been shown to be positively and significantly related to farm productivity. This implies that as the number of years spent in formal education increases, it makes farmers more productive. Higher literacy level influences farmers' productivity positively. This conforms to the findings of Kehinde (2005) and Idjesa (2007) which found that education was key to enhanced agricultural productivity. Osanyinlusi and Adenegan (2016), however posited that, an additional year of tertiary schooling has a negative effect on productivity. This confirms findings from Pudasaini (1983) which showed that as education level increases beyond a certain level, the rate of productivity declines hence there is diminishing marginal productivity returns at higher levels.

Table 3

Percentage distribution of host farmers according to various attributes

Host Farmer attribute		N	Percent (%)
Age of host farmer	41-50 years	102	32.4
	51-60 years	102	28.4
	61 years and above	102	25.5
	31-40years	102	8.80
	21-30yrs	102	2.90
	Below 20 years	102	1.00
	No response	102	1.00
Farming System	Small scale Farmer	102	50.0
	Large Scale Farmer	102	41.2
	Other	102	8.80
Level of income	Middle Income	102	62.7
	High Income	102	30.4
	Low Income	102	3.90
	Others	102	2.90
Education level farmer	University	102	46.10
	post-secondary	102	31.40
	secondary	102	8.80
	Primary	102	6.90
	other	102	6.90

d. Farming systems in the host farms

Table 3 shows the farming systems adopted by the host farmers. Majority (50.0%) of the farmers were engaged in large scale farming while 41.2% were small-scale farmers. 8.8% were in other systems of farming. Small scale farming which is sometimes referred to as "Family Faming" is a farm production system that bears the imprint of the structural link between economic activity and family structure (Deininger et al., 2011). This relationship influences the decision-making process, the type of farming, work organization and production management. Anything in the host farm that has an influence in decision making process most likely had an effect in experiential learning abilities of the students. According

to Kolbs (1984) decision making is one of the abilities a student must possess to enhance their experiential learning. Small Scale Farming (SSF) is a type of production system where the farm unit (a single farmer or a couple or a family or a cooperative) is at the same time the owner, the worker and the person who makes the decisions (IFAD, 2011). The structure of the small holder farming can bring conflicts when it comes to solving problems and making decisions in the farm (Niemela et al., 2005) and any conflict includes three interrelated dimensions: substance, procedure and relations.

e. Distribution of farmers according to level of income

Majority (62.4%) of the host farmers in FAP of Egerton university were middle income earners. The high-income farmers comprised 30.4% of the host farmers' population. Table 3 shows percentage distribution of the farmers based on their levels of income. Research has shown that small holder farms earn less income and live in poverty by internationally recognized standards. They also endure more hunger (Woomer & Canon, 2016). A student attached to low- income farm is likely to be affected by the situation in the farm like lack of enough food and this may have an effect on the students' willingness to be actively involved in the farm experiences and thus affect experiential learning.

4.2.2. Characteristics of the student's attributes

The students' attributes that were found to be relevant in this study included: students' levels of knowledge in agriculture, students' gender, students study programmes, academic departments, faculty and the year when the students participated on FAP (students' cohort).

a. Distribution of Students based on levels of prior agricultural knowledge

The type of agricultural knowledge required by students was gathered from the FAP online google groups that were created between 2015 and 2019. Data were also gathered from the baseline survey questionnaire. The types of knowledge indicators gathered from online google groups and FGD which were also found relevant to students' attributes specifically livestock, crop, agribusiness management and agricultural engineering knowledge. The constructs used to measure these indicators, which were also picked from the google platforms and FGDs, are displayed in the same table. Students were asked to rate the constructs on a 5-point continuum scale with a maximum of five (5) and a minimum of one (1). These ratings were later categorized as follows: 1-1.99=very low, 2-2.99=low, 3-3.99= moderate, 4-4.99=high and 5=

excellent. The students' levels of livestock, crop, agribusiness and agricultural engineering knowledge areas were determined.

To measure prior agricultural knowledge, students were asked to rate their levels of knowledge in the four areas of livestock, crop, agribusiness & economics and agricultural engineering as: very poor, poor, fair, good, or excellent. Tables 4,5,6& 7 shows the ratings of the constructs used to measure the four knowledge areas. According to Evans (2013), it is important to allow individual student to judge their own achievement as active participant of the assessment process by involving them in the feedback loop.

i). Livestock knowledge

Majority (42.1%) of the students rated their level of knowledge in diagnosis of livestock diseases as either poor or very poor. Those whoa rated their level of knowledge in animal nutrition as good comprised33.3%.

Table 4

Livestock knowledge levels as rated by students

	Diagn. livestock diseases	Nutrition	Zero grazing	Pig farming	Fish farming	Poultry farming	Dairy farming
V. Poor	13.7	11.8	12.7	22	19	7	8
Poor	28.4	14.7	19.6	31	36	20	13
fair	27.5	30.4	23.5	30	30	36	27
Good	26.5	33.3	30.4	12	13	27	22
Excellent	3.9	9.8	13.7	5	2	10	30

ii). Crops knowledge

The levels of various crop knowledge as rated by students and shown in Table 5 revealed that majority (35.3%) rated their knowledge level as fair in their ability to identify crop pests. Those who rated their levels in ability to decide and recommend to their farmers the appropriate registered pest control products were 36.3%. Another 33% of the students said their level of knowledge in plant breeding was poor. Table 5 shows the ratings for all the construct selected to measure crop indicators variables.

Table 5

Levels of knowledge in crop areas as rated by students

Ratings	Ident of pests	Crop pests	Reg. pest product	Weeds control	Soils	Vegetables	Field crops	Plant breeding
very poor	5.9	4.9	9.8	4.9	12.7	7.9	6.9	18
Poor	21.6	15.7	36.3	15.7	29.4	8.9	11.9	33
Fair	35.3	42.2	30.4	27.5	38.2	32.7	32.7	34
Good	22.5	24.5	17.6	26.5	14.7	34.7	33.7	13
Excellent	14.7	12.7	5.9	25.5	4.9	15.8	14.9	2
Total	100	100	100	100	100	100	100	100

iii). Agribusiness /Economics Knowledge

Constructs selected to measure the level of knowledge in agribusiness management/economics are shown in Table 6. The results showed that 41% (N=102) of the students rated their levels of knowledge in farm management as good. Thirty eight percent (38%) of the students rated their levels of knowledge in value addition as fair and 30% (N=102) of the students rated the knowledge levels in agricultural supply as excellent.

Table 6

Agribusiness /economics knowledge levels as rated by students

	Farm records	Farm Mgt	Marketing Farm produce	Value additions	input supply
Very poor	6	5	5	11	8
Poor	13	10	20	16	13
Fair	40	35	37	38	27
Good	35	41	34	32	22
Excellent	6	9	4	3	30
Total	100	100	100	100	100

iv). Agricultural engineering knowledge

In agricultural engineering knowledge area, 49% of the students rated their tractor driving and machinery operations as very poor. Thirty one percent (31%) of the students rated their knowledge areas in farm structures as good. Thirty four percent (34%) of the students rated their levels of knowledge in Farm tools and equipment as good. This probably means that majority of the students had it easy when using and maintaining farm tools and equipment. This is shown in Table 7.

Table 7

Agricultural engineering knowledge areas as rated by students

	Tools & equipment	Farm structures	Tractor driving
Very poor	8	7	49.0
Poor	11	18	24.5
Fair	28	31	22.5
Good	34	32	2.9
Excellent	19	12	1.0
Total	100	100	100

v). Knowledge in other areas

Finally, the students were asked to state other knowledge areas they felt inadequate in during FAP. The results are shown in Table 8. The knowledge gaps among the students were: skills and knowledge in tractor driving and operations. They added that most large-scale farms had tractors and other farm machinery that they could not operate. Students also said they needed more knowledge and information in: production of fruits, agroforestry, human resource management, good agricultural practices, report writing, relating with people, onion production, animal husbandry, farm planning, horticultural crops, mushroom growing, programme planning, managerial abilities, bee keeping, artificial insemination, artificial colostrum, crop farming systems, post-harvest practices, experimental designs, oil crop production, macadamia and bananas, rabbits keeping, Irrigation technology, budgeting and farm cost analysis, contour farming, knowledge on ecological area, knowledge on quality of products, storage of farm products, livestock handling, pasture production, soil sampling, knowledge on community development, animal breeding, feed formulation, computer knowledge, and projects management.

Table 8

Percentage distribution of other knowledge areas needed in FAP

Other knowledge areas	N	Valid percent
Bee keeping	100	20
Green house management	100	10
post-harvest management	100	10
computer knowledge	100	05
Farm produce marketing	100	07
organic farming	100	07
food safety	100	05

Prior knowledge helps to decrease cognitive load leading to good learning performance. This kind of knowledge also influences Learning Engagement (Ryan et al., 2005). Knowledge, interacts with other variables to influence learning outcomes. The relationship between prior knowledge and learning engagement can be further enhanced by self-regulated learning (Yang et al., 2018).

b. Student's distribution according to sources of knowledge

Students were asked to state their sources of knowledge during FAP. The results are shown in Figure 27. Majority (55.8%) of the students said their sources of knowledge was the internet. 39.5% of the students said they got their knowledge from agricultural officers. Small (16.3%) percentage of students reported that they got information and knowledge from their lecturers.

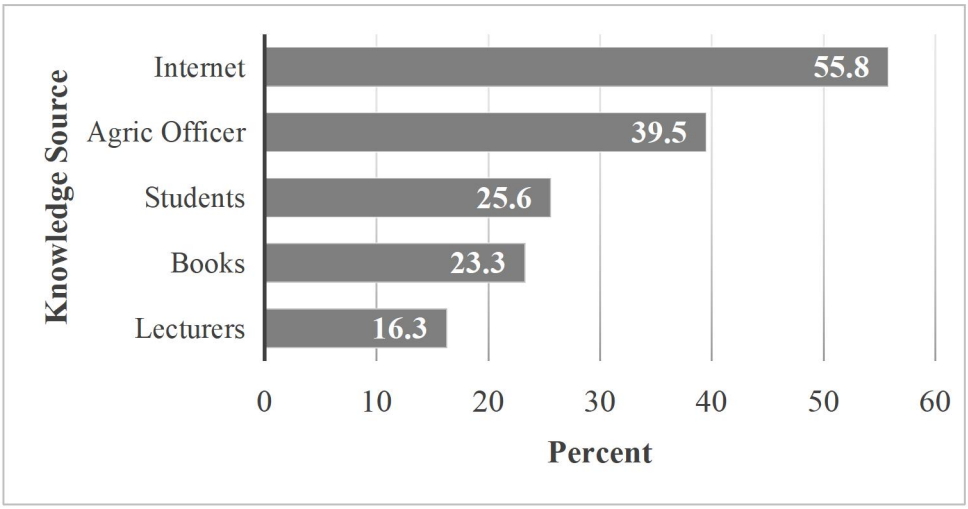


Figure 27. Sources of knowledge during FAP

Students were asked to state the challenges they faced in their endeavours to access the various knowledge sources during FAP. Sixty-five-point eight percent (65.8%) said that the books they needed for references were not available. 64.1% mentioned lack of internet bundles as a big problem because they could not access the online digital resources. 47.5% said the sources they were using was not reliable. The rest of the challenges are shown in Figure 28.

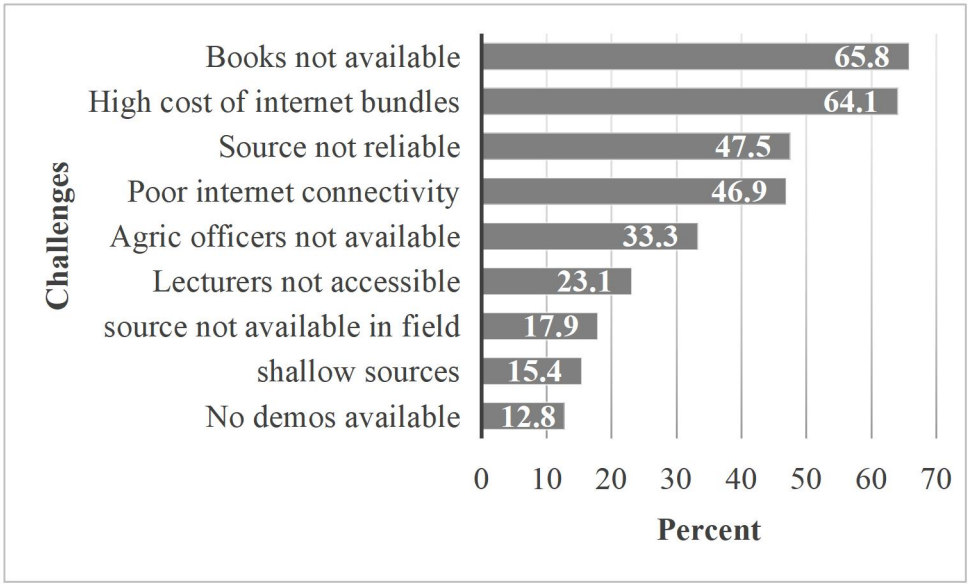


Figure 28. Distribution of students based on knowledge source challenges

Students were asked in an open question in the baseline questionnaire, to suggest ways of addressing the knowledge source challenges. Some students said that provision of online portals with up-to-date knowledge on farming would be appropriate. Others said that students said that more agricultural extension officers should be employed who could be consulted for solutions to challenges encountered during FAP. They added that these officers should be encouraged to be more friendly and some narrated their experiences as they sought answers from the field agricultural. Officers. Yet some students said that more practical units should be added to the university curricula. Others requested for more information on what to expect during FAP. Lecturers should give more information on what to expect during FAP.

Many students suggested that the university should provide internet bundles because books were not available and they could not access the university library. Students should be provided with sources of knowledge that were reliable during FAP. Some students felt that the host farmers should pay for the student's services which should go a long way to sourcing for information to sort out problems in the host farm. Some argued that if they knew the types of

enterprises to expect in the host farms, they would prepare better by carrying relevant lecture notes and text books. Some students wanted the supervisors to be more involved with the students during attachment. They added that a group of lecturers should be set aside to respond to students' questions during FAP. The students also said that prior to FAP, the farmers should be given clear guidelines on the types of jobs the students were to be engaged in. Lecturers should be accessible to students during attachment. Agricultural officers and supervisors from the university should organize field visits more often. Overall, many of the students were for the idea that an online digital platform should be set up to allow for real time interactions with the lecturers, agricultural officers and other professional in agriculture and related professions. They added that the online portal should have up to date knowledge on modern farming methods.

c. Distribution of students according to gender

The results on gender analysis revealed that, majority (76%) of the respondents were males while 24% were females. Figure 29 is a pie chart showing percentage gender distribution among students who participated in the baseline study.

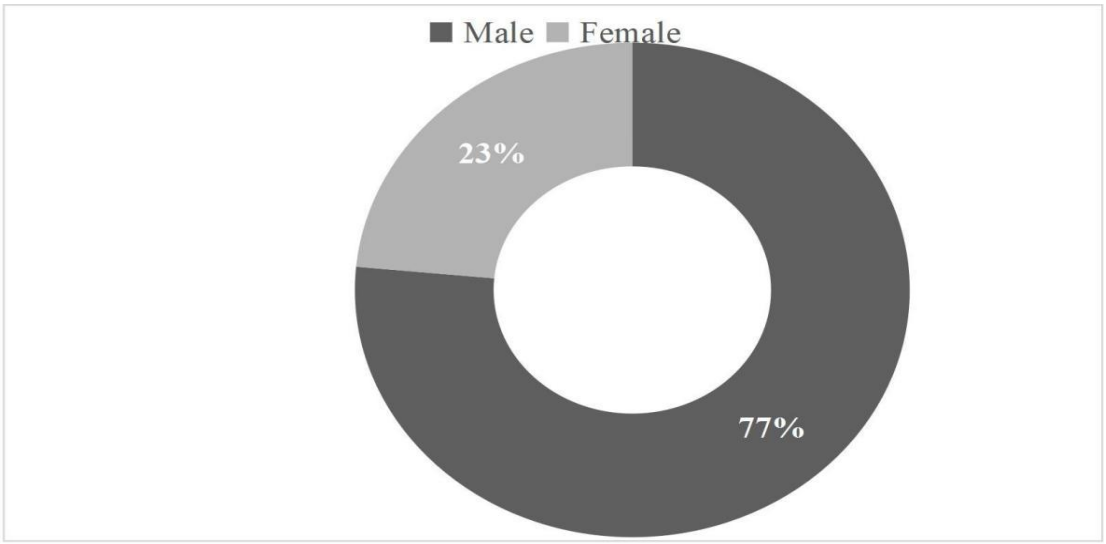


Figure 29. Percentage student's distribution by gender

d). Distribution of students according to study programmes

The students were asked to name the study programmes they were enrolled in at the university. The results are shown in Table 9. Majority (21.6%) of the students were drawn from BSc animal science programme. BSc. agribusiness management comprised 10.8% of the total student's population. BSc. Agric economics and BSc. Agriculture programmes had 10.8% student distribution. Some programmes namely; animal health, diplomas in agricultural

education, and in animal science programmes. had a small percentage distribution of one (1%) percent. Consequently, these programmes have been omitted in some analysis due to the small representation in numbers.

Table 9

Distribution of students based on study programmes

	Frequency	Valid Percent	Cumulative Percent
BSc Agri business mgt	11	10.8	10.8
BSc applied aquatic science	3	2.9	13.7
BSc Horticulture	8	7.8	21.6
BSc Agric Economics	11	10.8	32.4
BSc Agriculture	11	10.8	43.1
BSc AGED & Ext	9	8.8	52.0
BSc. soil environment & Land Use Mgt	3	2.9	54.9
Diploma in Farm Res. Mgt	9	8.8	63.7
Agriculture &Human ecology Ext	5	4.9	68.6
BSc Animal Science	22	21.6	90.2
Diploma in Horticulture	3	2.9	93.1
No response	1	1.0	94.1
BSc community development	3	2.9	97.1
Diploma in animal science	1	1.0	98.0
BSc. Animal Health	1	1.0	99.0
Diploma AGED	1	1.0	100.0
Total	102	100.0	

e. Distribution of students according to university academic departments

About seven departments were represented in FAP between the years 2016 to 2019. The highest (28.4%) representation came from the department of Agric economics and agribusiness management. This was followed closely by Animal Science department with 25% representation and in the third place was Crops, Horticulture and Soils department with a representation of representation of 24.5%. Table 10 shows students' percentage distribution according to university academic departments.

Table 10

Students' distribution based on university academic departments

	Frequency	Valid Percent	Cum. percent
Agric economics/ Agribusiness mgt	29	28.4	28.4
Biological science	3	2.9	31.4
Crops, Horticulture and Soils	25	24.5	55.9
Agric Education &Ext	10	9.8	65.7
Applied community Dev. Studies	8	7.8	73.5
Animal Science	25	24.5	98.0
No response	1	1.0	99.0
Animal health	1	1.0	100.0
Total	102	100	

f. Distribution of students based on faculties in the university

A total of four faculties were represented in FAP between the years 2016 to 2019. The highest (77.5%) student representation came from the faculty of Agriculture. This is followed by faculty of education and community studies with a representation of 17.6%. the rest of the student's distribution frequencies and percentages are shown in Table 11.

Table 11

Student distribution based on university academic faculties

Programme faculties	Frequency	Valid Percent	Cumulative Percent
Agriculture	79	77.5	77.5
Science	3	2.9	80.4
Education & Community Studies	18	17.6	98
No response	1	1.0	99
Veterinary Medicine & surgery	1	1.0	100
Total	102	100	

g. Distribution of students according to year of FAP (Cohort)

Students were asked to record the year when they participated in the FAP programme. The results in Table 12 shows that majority of the students were drawn from the year 2019. The students especially the 2019 class in agribusiness and agricultural economics were intrinsically motivated to join in the programme.

Table 12

Distribution of students according to year of attachment (cohort)

	Frequency	Valid Percent	Cumulative Percent
2016	31	30.4	30.4
2017	23	22.5	52.9
2018	8	7.8	60.8
2019	40	39.2	100
Total	102	100	

4.2.3 Characteristics of FAP structure and implementation attributes

The students were asked to rate the extent to which certain constructs were structured within FAP by the university constituting FAP structure and implementation constructs.

a. Characteristics of FAP structure attributes

The results showing FAP structure attributes that were measured in this study are shown in Table 13. Out of a hundred students who responded to this item in the questionnaire, 54 students felt that the matching of students with the host farmers was either very poorly or poorly done. Majority (61%) said that task analysis was either poorly or very poorly structured.

Table 13

Distribution of students based on FAP Structure constructs

Rating	Require planning	Require analyzed jobs	Match Farmers/ Students	Require good report	Require job sheet preparation	Require analyzed tasks
			Valid percentage			
V. poor	13	14	20	19	27.7	26
Poor	31	34	34	23	32.7	35
Fair	36	35	23	28	27.7	28
Good	17	14	20	25	8.9	8
Excellent	3	3	3	5	3	3
	100	100	100	100	100	100

b. Characteristics of FAP implementation attributes

The attributes that were used to measure the FAP implementation ability included: assigning project /innovation to a farm worker or family member, conducting job analysis, collection of farm data and analysis, conducting task analysis, Reflections on learnt experiences, Preparing job sheets and identification of host farm enterprises. Table 14 shows the ratings by the students on different constructs selected to measure implementation. Three percent of the students said that their level of conducting job analysis was excellent while 3% reported that their level of task analysis was excellent. 16% of the students said that their level of identifying farm enterprises was excellent.

Table 14

Construct to measure the FAP implementation attribute

Level of	Ident. Enterprises	Conducting job analysis	Conducting Task analysis	Job sheets	Reflection	Data analysis	continuity arrangement.
			Valid percent				
Very poor	11	15	14	15	16	17	20
Poor	24	47	37	34	33	37	42
Fair	26	24	37	25	31	34	30
Good	23	11	9	23	17	9	6
Excellent	16	3	3	3	3	3	2
Total	100	100	100	100	100	100	100

It may be argued that the construct selected to measure FAP structure and implementation were not as originally designed in the FAP programme. However according to Kolbs (1984) any learning approach that does not allow students to reflect on their learning experiences does not qualify to be experiential learning. Identifying host farm enterprises and allowing students to conduct job and task analysis as well as jobsheet preparation allowed students to reflect on their learning experiences. The original FAP was designed to allow students to make comments in their logbooks without paying much attention to specific knowledge, skills, attitudes and experiences acquired during the learning process.

4.2.4 Determining constructs levels for computing of ELA index

To determine the overall ELA level, various constructs were used to measure the five indicators of experiential learning ability identified by Kolbs (1984) as: Willingness to get actively involved in the learning experiences, ability to reflect, analyze, solve problems and make decisions and finally, make arrangement for continuity of projects/innovations initiated in the host farm. These constructs and their levels are shown in Table 15. Students were asked to rate their levels of knowledge on a 5- point continuum scale. The ratings were then categorized as follows: 1-1.99= very low rating,2-1.99= moderate rating, 3-4.99 = high rating and 5= excellent, a rating that did not require any enhancement of the attributes in question. The results showed that willingness to prepare job operation sheets was given a low rating (M=2.74, SD =1.05). Willingness for job planning was given a moderate rating (M=3.13, SD = 1.22) and willingness to participate in the farm experiences like digging, milking etc. was given a moderate rating (M= 3.18, SD =1.18). Reflecting on learning experience by recording the experiences in a logbook was given moderate rating (M = 3.00, SD= 1.17). Reflection by writing a good field attachment report of high quality, was given a low rating (M = 2.89, SD=0.96) and reflecting by keeping farm records was given a moderate rating (M = 3.02, SD =1.19). The indicator that was rated the lowest was that of making continuity arrangement for projects and innovations initiated in the host farms by the students. Rating for written projects documents left behind by outgoing students to guide the incoming cohort of students, was low (M= 2.30, SD=0.6). The rating for putting a worker to be in charge of the project was also given a low rating. (M= 2.25, SD= 0.9), the rating for making continuity arrangement generally was also low (M=2.56, SD = 0.9).

Table 15

Constructs ratings for experiential learning ability indicators

		N	min	max	mean	SD	Rating
Willingness	i. participates in experiences	100	1	5	3.18	1.18	Moderate
	ii. planning for jobs	102	1	5	3.13	1.22	Moderate
	iii. Preparation of daily job sheets	102	1	5	2.74	1.05	low
Reflection	i. records in logbook	102	1	5	3.00	1.17	Moderate
	ii. keeping farm records	100	1	5	3.02	1.19	Moderate
	ii. quality field attachment report	102	1	5	2.89	0.96	Low
	iv. Evaluating learnt experiences	101	1	5	2.84	0.97	low
Analysis	i. Carrying out Task analysis	99	1	5	2.69	0.99	Low
	ii. Collecting data	102	1	5	2.53	0.96	Low
	iii. Carrying out Job Analysis	100	1	5	2.84	1.08	Low
	iv. Designing evaluations	102	1	5	2.46	0.90	Low
Problem	i. problem solving level	101	1	5	2.77	0.95	Low
Solving_	ii. decision-making level	102	1	4	2.44	0.92	Low
Decision	iii. rating of problems solved	102	1	4	2.01	0.92	Low
Making	iv. Rating problems identified	101	1	5	2.92	1.11	Low
	v. Rating No. of decisions made	101	1	5	3.07	1.11	Moderate
Continuity	i. Rating project documents	102	1	4	2.30	0.6	Low
Arrangement	ii. worker to care for projects	102	1	5	2.25	0.9	Low
	iii. making continuity arr.	102	1	4	2.56	0.9	Low

To measure the levels of experiential learning ability, the average ratings for the indicator constructs, shown in Table 16, were compounded to give the experiential learning ability indices including; willingness index (Wi), Reflection index (Ri) analysis index (Ai) problem solving and decision-making index (PDi) and continuity arrangement index (CAi). The overall experiential learning ability index among students on FAP was found to be low (M=2.79, SD= 0.51). The willingness index rated highest among the five abilities with a moderate rating (M= 3.02, SD = 1.15). The ability to make continuity arrangements for initiated projects received the lowest (M= 2.37, SD=0.18) rating overall.

Table 16

Learning Ability indices

Experiential learning ability	N	Min	Max	Mean	SD
Willingness index (Wi)	101	1	5	3.02	1.15
Reflection index (Ri)	101	1	5	2.94	0.12
Analysis Index (Ai)	101	1	5	2.63	0.98
Problem and Decision Index (PDi)	100	1	5	2.64	0.10
Continuity Arrangement Index (Cai)	102	1	4	2.37	0.18
Experiential Learning Ability Index	101	1	5	2.79	0.51

4.2.5 Levels of experiential learning ability obtained with each FAP design attribute

To measure the levels of experiential learning based on FAP design attributes, a comparison of ELA means was done for each of the FAP design attributes including: the host farmer attributes, students' attributes, FAP structure and implementation attributes

4.2.6 Level obtained with each student's attributes

An analysis was conducted to find out the levels of experiential learning ability obtained with each of the students' attributes including: the levels of prior agricultural knowledge, gender, study programmes, departments, faculties and student's year of FAP.

a. Prior agricultural Knowledge

The prior knowledge area was evaluated by assessing Livestock, crop, agribusiness and agricultural engineering knowledge areas. The knowledge constructs used to determine livestock knowledge area index included; dairy farming, poultry farming, pig farming, fish farming, zero grazing, diagnosis of livestock diseases and on livestock nutrition. The results showed that, Knowledge in fish farming was rated lowest (M=2.43, SD=1.00). The construct that received the highest ratings compared to others was knowledge on dairy farming (mean=3.53, SD=1.16). Overall, the rating for livestock indicator variable was low (M =2.94, SE=0.89). Lack of adequate skills on fish farming among the farmers is a huge drawback and causes huge losses to those famers who venture in this type of farming. Fish farming requires that farmers undergo training and seek advice from fisheries experts on where to locate the ponds and about general fish management (Ngugi et al., 2007). This may explain why fish

farming got the lowest ratings among the livestock knowledge areas ratings it also appeared that majority of the students did not possess this type of agricultural knowledge and hence the low ratings.

Crop knowledge area was measured using the constructs shown in Table 17. Plant breeding, soils and registered pest control products knowledge areas were rated low (M=2.48, 2.70, 2.74; SD=1.10, 1.03, 1.05 respectively). Knowledge on field crops, vegetable farming and weeds and their control were moderately rated (M= 3.38, 3.42, 3.52; SD= 1.8, 1.10 and 1.0 respectively). Table 17 indicates students' prior levels in selected crop knowledge areas. The table shows all the crop knowledge constructs as rated by the students in self -assessment. The overall rating for crop production knowledge was moderate (m= 3.08, SD=0.769). This rating was better than that of livestock knowledge area.

Table 17

Students' prior agricultural knowledge levels in livestock and crop areas

Prior agricultural know. area		N	Mn	Mx	Mean	SD	Rating
Livestock	Fish Farming	100	1	5	2.43	1.00	Low
	Pig Farming	100	1	5	2.47	1.11	Low
	Diag. of diseases	102	1	5	2.78	1.10	Low
	Zero grazing	102	1	5	3.13	1.25	moderate
	Poultry farming	100	1	5	3.13	1.07	Moderate
	livestock nutrition	102	1	5	3.15	1.16	Moderate
	Dairy Farming	100	1	5	3.53	1.16	Moderate
	Livestock K. index	102	1	4.71	2.94	0.87	Low
Crop	Plant Breeding	100	1	5	2.48	1.10	Low
	Soils	102	1	5	2.70	1.03	Low
	Reg. pest products	102	1	5	2.74	1.05	Low
	Ident. of crop pest	102	1	5	3.19	1.12	moderate
	Crop pests	102	1	5	3.25	1.03	Moderate
	Field crops	101	1	5	3.38	1.09	Moderate
	Vegetable farming	101	1	5	3.42	1.10	Moderate
	weeds and control	102	1	5	3.52	1.18	Moderate
	Crop K. Index	102	1	4.63	3.08	0.769	moderate

Agribusiness and agricultural engineering knowledge areas were measured using constructs shown in Table 18. The results showed that all the knowledge areas assessed were rated as moderate in both knowledge areas except the knowledge area in tractor operation and farm machinery which received a very low (M=1.02, SD0.14) rating. The results showed that the overall rating of prior agricultural knowledge for all 102 students on FAP was low (M=2.94, SD=1.16).

Table 18

Students' prior agricultural knowledge levels in agribusiness and Agric engineering area

Knowledge Area	Knowledge area constructs	N	Min	Max	Mean	SD	Rating
Agri	Value additions	100	1	5	3.00	1.03	Moderate
Business	Input supply	100	1	5	3.11	1.01	Moderate
	Marketing F. produce	100	1	5	3.12	0.95	Moderate
	Keeping farm records	100	1	5	3.22	0.96	Moderate
	Farm Management	100	1	5	3.39	0.96	Moderate
Agribus. Knowledge index		100	1	4.60	3.17	0.763	Moderate
Agric	Tractor &Machinery	101	1	5	1.02	0.14	Very Low
engineering	Farm Structures	100	1	5	3.24	1.1	Moderate
	Tools and Equipment	100	1	5	3.45	1.16	Moderate
Engineer. knowledge index		100	1	5	2.57		low
Overall	Prior Agric K. index	102	1		2.94		Low

The results are displayed in Table 19 revealing that those students who had low levels of prior agricultural knowledge exhibited low levels of experiential leaning ability. The students with high levels of prior agricultural knowledge exhibited high levels of experiential learning abilities. One way ANOVA test revealed that the levels of knowledge and experiential learning abilities were significantly (F (2.94) =4.099, p=.020).

Table 19

Levels of experiential learning ability according to prior agricultural knowledge levels

Experiential Ability Index						
Total knowledge Level	Mean	N	Std. Dev	Min	Max	rating
Low levels of knowledge	2.55	35	0.75	1.05	3.95	Low
Moderate levels of knowledge	2.85	29	0.78	1.00	3.93	low
High levels of knowledge	3.04	33	0.61	1.00	3.83	moderate
Total	2.81	97	0.74	1.00	3.95	Low

b. Experiential learning abilities based on gender

The second student attribute was gender. The experiential learning ability means were computed for this variable and the results are shown in Table 20. The mean for experiential learning ability among the males was higher than that of the females. ANOVA analysis revealed that there was indeed a statistically significant difference between the experiential learning ability levels in males and the females, (F (1,96) = 4.466, p=.036)

Table 20

Levels of experiential learning ability according to Gender

	Experiential Ability Index						
Gender	N	Mean	N	SD	Min	Max	Rating
Male	74	2.888	74	0.687	1	3.95	Low
Female	24	2.522	24	0.847	1	3.93	Low
Total	98	2.795	98	0.741	1	3.95	Low

Gender is considered an important aspect in experiential learning. According to slater et al., female participants are more; accepting, feeling, receptive graspers of experience, and collaborative. On the other hand, male participants are logical, analytical, present-oriented graspers of experience, and they are also competitive. These differences may have resulted into the significant difference in levels of experiential learning ability between the males and the females.

c. Experiential learning ability based on study programmes

The third attribute was the student's study programme. The means of the students' ratings are shown in Table 21. The Results revealed that the experiential learning ability among students taking agricultural education and extension study programme was rated highest (mean= 3.21, SD = 0.43; based on N=9). The study programme that had the lowest rating in experiential learning ability was BSc in Applied Aquatic Science (Mean=1.84, SD=0.41, based on N=3). BSc. Agricultural education and Extension (BSc Aged & Ext) is a teacher training programme which is conversant with teaching and learning processes and this may have contributed to the higher ratings in experiential learning abilities compared to other study programmes. BSc. Aquatic science is not an agricultural programme per se and this could be used to explain the poor performance of the students in experiential learning ability because the students were not so knowledgeable in agricultural matters. Interpreted in terms of the indicators used to measure experiential learning abilities, it can be said that the BSc. Science students were not

so willing to be actively involved in the learning experiences, they did not have abilities to reflect on what they learnt from their host farms in addition to analyzing learning experiences. It also implies that these students did not have problem solving skills in the farm, were not able to make decisions and did not have the ability to make continuity arrangements for projects /innovations they initiated in their host farms.

Table 21

Students' levels of experiential learning ability per study programmes

Study programme	ELA index	N	SD	Min	Max	Rating
BSc Aged &Ext	3.2	9	0.4	2.5	4.0	Moderate
BSc Animal Science	3.2	20	0.6	1.7	3.8	Moderate
Diploma in Farm Res. Mgt	3.1	9	0.7	1.9	3.8	Moderate
Diploma in Horticulture	3.1	3	0.4	2.8	3.5	Moderate
BSc Community Dev	2.9	3	0.4	2.5	3.3	Low
BSc. Soil Env. & Land use Mgt	2.8	3	0.6	2.3	3.5	Low
Diploma Aged	2.8	2	0.3	2.8	2.8	Low
BSc Agric	2.8	11	0.9	1.0	3.8	Low
BSc Horticulture	2.6	8	1.2	1.0	3.9	Low
BSc Agric Econ	2.6	12	0.5	1.9	3.5	Low
Diploma in Animal Science	2.5	2	0.3	2.5	2.5	Low
BSc Agri Business Mgt	2.4	9	0.4	1.8	3.0	Low
Agric & Human Ext Ecology	2.2	5	1.1	1.0	3.3	Low
BSc. Animal Health	2.1	2	0.3	2.1	2.1	Low
BSc Applied Aquatic Science	1.8	3	0.4	1.6	2.3	Very low
Study programme ELA index	2.79	101	0.7	1.0	4.0	Low

The different levels of knowledge noted between the study programme may have affected the levels of experiential learning ability.

d. Experiential learning ability levels based on university academic departments

Students belonged to different departments. The levels of experiential learning based on the academic departments were determined. Descriptive statistics were also run to calculate the mean ratings in experiential learning abilities based on students' academic departments. The results shown in Table 22 indicated that the departments of Aged & extension and animal Science received the highest (3.17, SD= 0.04 based on N=10) rating in experiential learning ability.

Table 22

Students' levels of experiential learning ability per academic departments

	Experiential Ability Index					
Department	ELA Index	N	SD	Min	Max	Rating
Agribusiness/ Economics	2.65	28	0.59	1.80	3.80	Low
Biological science	1.84	3	0.41	1.58	2.32	Very low
Crops, Horticulture and Soils	2.75	25	0.88	1.00	3.93	Low
Agric educ & Extension & Ext	3.17	10	0.43	2.52	3.95	Moderate
Applied community Dev. studies	2.47	8	0.94	1.00	3.30	Low
Animal Science	3.13	23	0.62	1.65	3.83	Moderate
Animal Health	2.07	2	0.22	2.07	2.07	Low
Total	2.79	98	0.74	1.00	3.95	Low

An analysis carried out to measure the levels of ELAs based on the faculties that the students belonged to showed that there were no significant differences in the ELA levels.

e. Experiential learning Ability index based on year of attachment (Cohort)

Finally, there was an assessment of the levels of experiential learning abilities based on the student's year of attachment. The results displayed in Table 23 revealed that those students who had their FAP in the years 2017 and 2018 had moderate indices for experiential learning. The students who attended FAP in 2019 had the least experiential learning ability level

Table 23

Students experiential learning ability levels for the years of attachment

Experiential Ability Index						
Students' year of attachment	ELA Index	N	SD	Min	Max	Rating
2016	2.75	30	0.88	1.00	3.95	Low
2017	3.14	23	0.61	1.79	3.93	Moderate
2018	3.25	6	0.82	1.65	3.83	Moderate
2019	2.56	39	0.59	1.00	3.63	Low
Total	2.79	98	0.74	1.00	3.95	Low

f. Levels of experiential learning ability obtained with each host farmer's attributes

Some students blamed their poor performance in the farms on their host farmers. Some said their farmers were too old, others said their host farmers were not well to do and it was therefore critical to find out the levels of experiential learning levels based on the host farmers attributes. Analysis was done to determine the levels of experiential learning among students hosted by farmers of different age brackets. The results shown in Table 24 is a comparison of the ELA levels among students hosted by farmers of different ages. Those students hosted by farmers aged between 51-60 years had a slightly higher (mean=3.0, N=29 and SD=0.63) level of ELA compared to other students hosted by farmers of other age brackets.

Table 24

Students experiential learning ability levels based on host farmers' age

		Experiential Ability Index				
Age of host farmer	N	ELA Index	Min	Max	SD	Rating
21-30yrs	4	2.7	1.8	3.5	0.87	Low
31-40yrs	8	2.7	1.0	3.7	0.89	Low
41-50 years	32	2.8	1.6	4.0	0.71	Low
51-60yrs	29	3.0	1.1	3.8	0.63	Moderate
61yrs and above	25	2.7	1.0	3.8	0.80	Low
Total	98	2.8	1.0	4.0	0.74	Low

An ANOVA test was run to test if there was a statically significant difference between the ELA levels among students hosted by farmers of different age brackets. Although the levels of ELAs for students hosted by farmers of different ages were found not to be significantly ($F(2.95) = 1.693$, $p=.189$) different, it is important to note that the levels of ELAs were still low and one possible explanation would be that the low levels were as a result of other factors other than the farmer's ages.

The third host farmer attribute that was considered was the type of the farming system of the host farmer. The results shown in Table 25 revealed that the experiential learning abilities for students hosted in small, large scale or any other farming system were rated low.

Table 25

Students experiential learning ability levels based on the farming system of host farmer

		Experiential Ability Index				
Farming system	N	Mean	Min	Max	SD	Rating
Small scale Farmer	51	2.84	1.00	3.93	0.767	Low
Large Scale Farmer	39	2.82	1.79	3.83	0.623	Low
Other	8	2.33	1.00	3.95	1.023	Low
Total	98	2.79	1.00	3.95	0.741	Low

The experiential learning ability among students on FAP was also measured based on the host farmer's level of education. The results are shown in Table 26. It was noted that all the levels of experiential learning ability were low irrespective of the farmers level of education. The

results showed that the experiential learning index for students hosted by farmers who had post- secondary education was the highest (mean=2.95, SD=0.73) although the rating levels were low.

Table 26

Students experiential learning ability based on the host farmers' level of education

Experiential Ability Index						
Education level farmer	ELA index	Minimum	Maximum	Std. Deviation	N	Rating
Primary	2.32	1.00	3.13	0.85	6	Low
Secondary	2.65	1.65	3.43	0.63	8	Low
Post-Secondary	2.95	1.00	3.93	0.73	32	Low
University	2.83	1.13	3.95	0.73	46	Low
Other	2.39	1.00	3.28	0.81	6	Low
Total	2.79	1.00	3.95	0.74	98	Low

The final analysis of the experiential learning ability was based on the host farmer's income level of the host farmers. The results are shown in Table 27. Students hosted either in middle- or high- income farmers exhibited a high levels of experiential learning ability. students hosted by low- income farmers had low levels of experiential learning.

Table 27

Students' levels of experiential learning ability based on income levels of the host farmers

Experiential Ability Index						
Income level of farmer	Mean	N	SD	Min	Max	Rating
High Income	2.8	30	0.7	1.1	4.0	Low
Middle Income	2.8	63	0.7	1.0	4.0	Low
Low Income	2.4	5	1.2	1.0	3.5	Low
Total	2.8	98	0.7	1.0	4.0	Low

The low-income status of the host farmer may have affected the willingness of the students to be actively involved in the farm experiences due to motivation. There was probably no incentive to captivate the student's participation in the farm experiences.

g. Levels obtained on ELA with each FAP structure and implementation attribute

Students were asked to rate various aspects of FAP structure and implementation in a 5point continuum scale. The FAP structure referred to the what the university had put in place as students' requirements e.g., the university demanding that the students write a good quality field attachment report or requirement for farms to have already documented jobs available so that students would easily identify farms with the best experiential learning opportunities based on their knowledge and skills. Not all requirements from the university were considered as structural or implementation attributes because some were not related to students' ELAs. The results for FAP structure and FAP implementation attributes are shown in Table 28 and 29 respectively. These aspects came up during the FGDs held with the students. Requirements to have a prepared jobsheet to allow students prepare for equipment and materials to be used in the farm learning experiences well in advance was a structure that needed to be put in place. In other words, students needed a well-designed jobsheet preparation template for use during FAP. These and other structures sown in Table 28 were rated by the students. The structure to ensure host farms had documented and analyzed jobs and tasks were rated lowest (M=2.27, SD=1.057). Some students complained that they were not prepared well to write good field attachment reports and this may explain why the rating for this construct was low (M=2.74, SD=1.17). Overall, the FAP structure index was low (M=2.51, SD= 0.069).

Table 28

FAP structure levels

FAP structure construct	N	Min	Max	Mean	SD	Rating
Require writing of quality field attachment reports	100	1	5	2.74	1.177	Low
Require already identified farm jobs	100	1	5	2.66	1.007	Low
Require jobsheet preparation	100	1	5	2.58	0.997	Low
Require matching students and host farmers	100	1	5	2.52	1.114	Low
Require analyzed jobs in the host farm	100	1	5	2.27	1.033	Low
Require analyzed tasks requirement	101	1	5	2.27	1.057	Low
FAP structure index	100	1	5	2.51	0.069	Low

Students were also asked to rate construct that would help in measuring the FAP implementation attribute. The results are shown in Table 29. In the implementation of FAP students said they needed to prepare jobsheets for instance to plan for activities in the farm. Such constructs were assessed. Others construct included rating on conducting job analysis, task analysis among others. The rating on making continuity arrangement was rated low (M=2.28, SD=0.92). Overall, the FAP implementation index was low (m= 2.59, SD=0.105).

Table 29

Ratings for FAP implementation indicators

Implementation Indicators	N	Min	Max	Construct	SD	Rating
Making continuity arrangement	100	1	5	2.28	0.92	Low
Conducting job analysis	100	1	5	2.4	0.97	Low
Collection of farm data and analysis	100	1	5	2.44	0.98	Low
Conducting task analysis	100	1	5	2.5	0.95	Low
Reflections on learnt experiences	100	1	5	2.58	1.05	Low
Preparing job sheets	100	1	5	2.65	1.09	Low
Identification of host farm enterprises	100	1	5	3.09	1.25	Moderate
FAP Implementation Index	100	1	5	2.59	0.105	Low

The total ratings for both structure and implementation from all the students were categorized into three levels": low, moderate and high levels as shown in Table 30.

Table 30

Students experiential learning levels based on the FAP structure

Experiential Ability Index						
FAP Structure level	levels	N	SD	Min	Max	Rating
Low structure levels	2.60	32	0.80	1.00	4.00	Low
Medium structure levels	2.80	38	0.70	1.00	3.80	Low
High structure levels	3.10	27	0.60	1.10	3.80	Moderate
Total	2.80	97	0.70	1.00	4.00	low

Table 31 shows a summary of the experiential learning ability based on levels of FAP implementation. ANOVA was conducted to test if there was a significant (F (2,94) =4.309, p=.016) difference between experiential learning abilities based on levels of FAP implementation. The results showed that the student whose levels of FAP implementation were rated as low, had low levels of experiential learning abilities. Those who had high FAP implementation levels, recorded high experiential learning abilities.

Table 31

Students experiential learning ability with each FAP implementation level

Experiential Ability Index						
FAP Implementation level	Mean	N	SD	Min	Max	Rating
Low implementation levels	2.5	32	0.80	1.00	3.90	Low
Medium implementation levels	2.7	34	0.60	1.00	4.00	Low
High implementation levels	3.2	31	0.60	1.10	3.80	Moderate
Total	2.8	97	0.70	1.00	4.00	Low

To test for the significance of the differences in experiential learning abilities among different levels of implementation of FAP, the test revealed that there was a statistically significant (F (2,94) =8.251, p = .001) difference in experiential learning abilities among the three levels of FAP implementation.

4.3 Effects of FAP Attributes on Students' Practicum Competences (ELAs)

The second objective of this study was:

To assess how practicum student competencies (ELAs) are affected by FAP attributes in Egerton University

The following variables were operationalized as the FAP design attributes; (i) Students' attributes (ii) Host farmers' attributes (iii) FAP structure and implementation attributes. To assess the effects of FAP design attribute on students' practicum competences (ELAs), boxplots were used to explore the directional effects of the data variables.

4.3.1 Effects of ELAs on each student's attributes

Students' attributes that were found relevant to this study included: **i)** Prior agricultural knowledge, ii). Gender iii) study programmes iv) university academic departments v) university faculties and vi) year of attachment.

a. Effects students' Agricultural Knowledge Levels on ELAs

To explore the effects of students' prior agricultural knowledge on students ELAs, the ratings obtained for prior agricultural knowledge levels were recoded into three categories of low, moderate and high levels of knowledge using Statistical Package for Social Sciences (SPSS). Boxplots shown in figure 30 were drawn to explore the effects. The results showed that there was a positive level of knowledge affected the ELAs positively with low levels of prior agricultural knowledge coinciding with low levels of ELAs, moderate levels of knowledge matched with moderate levels of Experiential learning abilities and high levels of knowledge with high experiential learning abilities.

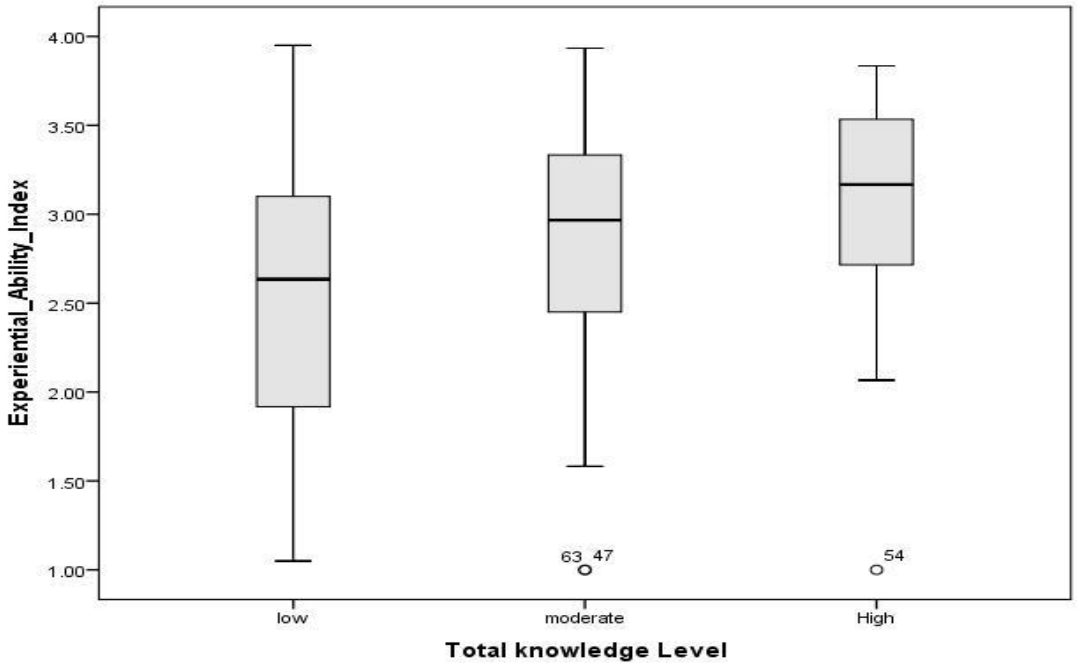


Figure 30. Effect of prior agricultural knowledge levels on ELAs

This means that the students who rated high in levels of agricultural knowledge were more willing to get actively involved in the farm experiences. There were also: more reflective in their learning experiences, more analytical, able to solve more problems and make better decisions in addition to making continuity arrangement of any projects/innovations initiated by the students in the host farms. This agrees with what was posited by Moon et al. (2016) that minimally guided learning approach e.g., experiential learning required prior knowledge for internal guidance.

b. Effects of gender attribute on ELAs

Boxplots shown in figure 31 were ran to explore the effect of gender on experiential learning ability. The results showed that males had more positive effects on ELAs than the females. In other words, the males were more willing to get actively involved in the learning farm practices than the females. They were also more reflective in their learning, more analytical, were better problem solvers and decision makers than the females. There is need to find out why the male levels were higher than the females yet both genders attended classes together. The variability of the scores illustrated by the length of the box showed that distribution of the scores obtained from the male participants more precise and therefore more reliable.

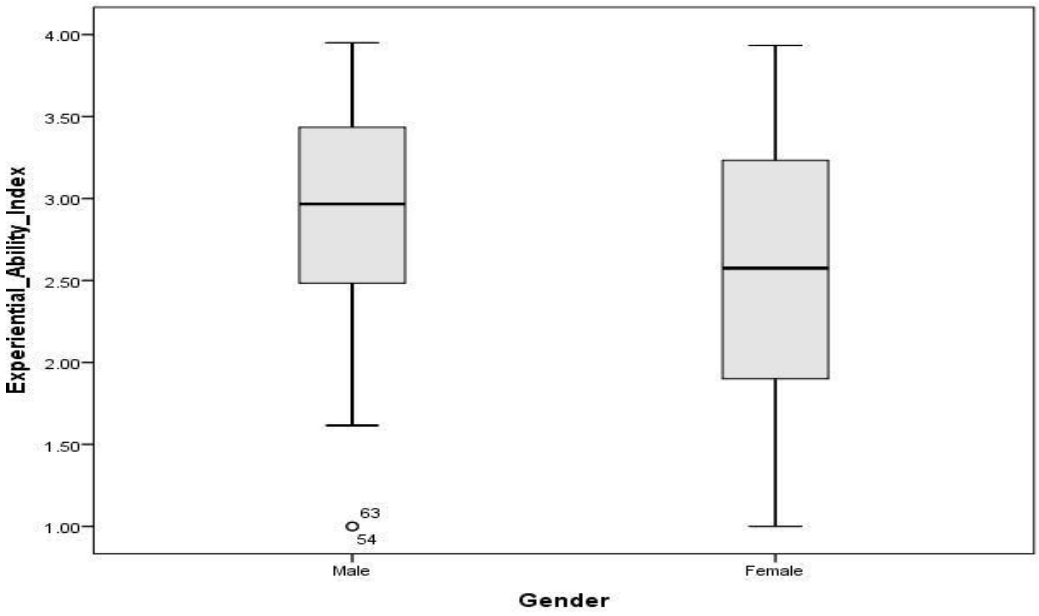


Figure 31. Effect of gender on ELAs

Gender is considered an important aspect in experiential learning. According slater et al. 2007), female participants are more; accepting, feeling, receptive graspers of experience, and collaborative. On the other hand, male participants are logical, analytical, present-oriented graspers of experience, and they are also competitive. These differences may have resulted into the significant differences in levels of experiential learning ability between the males and the females

c. Effects of Student's Academic Department on ELAs

Another exploration using boxplots shown in figure 32 was done to visualize the effects university academic departments on experiential learning ability. The results revealed that the students belonging to animal science and AGED departments affected the students' levels of

ELAs more positively compared to other departments. ELAs for students in animal science department rated higher than any other department but this was after sing the median as a measure of central tendency. On the other hand, using the mean the students in the department of agricultural education and extension (shown as AGED in figure 32) was rated higher than other departments. There was a wider variability in the scores posted by students in animal science department than those in Aged & Ext. The extreme scores ratings by Animal Science students affected the mean. Students in the Biological science department had the lowest rating in ELAs as shown by the boxplots. This was expected because the study programmes in this department are not agricultural in nature and the only enterprise, these students could effectively be engaged in, was fish farming. As shown in the previous section, the type and level of agricultural knowledge had an effect on the level of experiential learning.

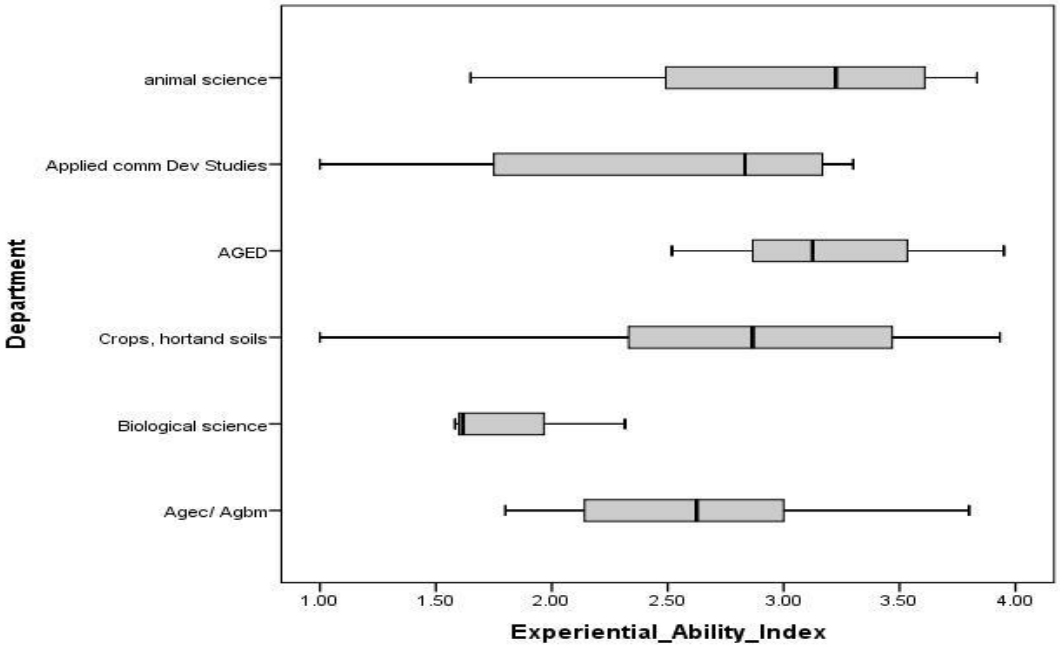


Figure 32. Effect of academic department on experiential learning ability

d. Effects of year of student's attachment (Cohort) on ELAs

The final exploration on students' attributes was on the effect of year of attachment as scheduled by the University, on experiential learning ability. The results shown in Figure 33 revealed that there was a positive effect between the students' year of attachment and levels of experiential learning ability. Students who attended FAP in 2018 had the highest score in experiential learning ability. Those students who attended FAP in 2019 received lowest rating. This means that the students who attended FAP in 2018 were more willing to get actively

involved in farm experiences, they were more reflective and analytical. In addition, they were able to solve problems and make decisions better compared to other years. The data collected from the focus group discussions showed that those students who were out on FAP in 2019 had complaints that may have affected their ELAs. For example, a group of students narrated how they were asked to hold a sick cow in an upright position for two hours by the director of the farm that hosted them. Others complained that their host farmers used them as a source of cheap labour. There is need to keep the initial enthusiasm in the FAP programme as the programme matures. If not checked, this may demotivate students and eventually affect their willingness to participate in the learning experiences provided in FAP. Students in other years appeared more enthusiastic in participating in the FAP programme.

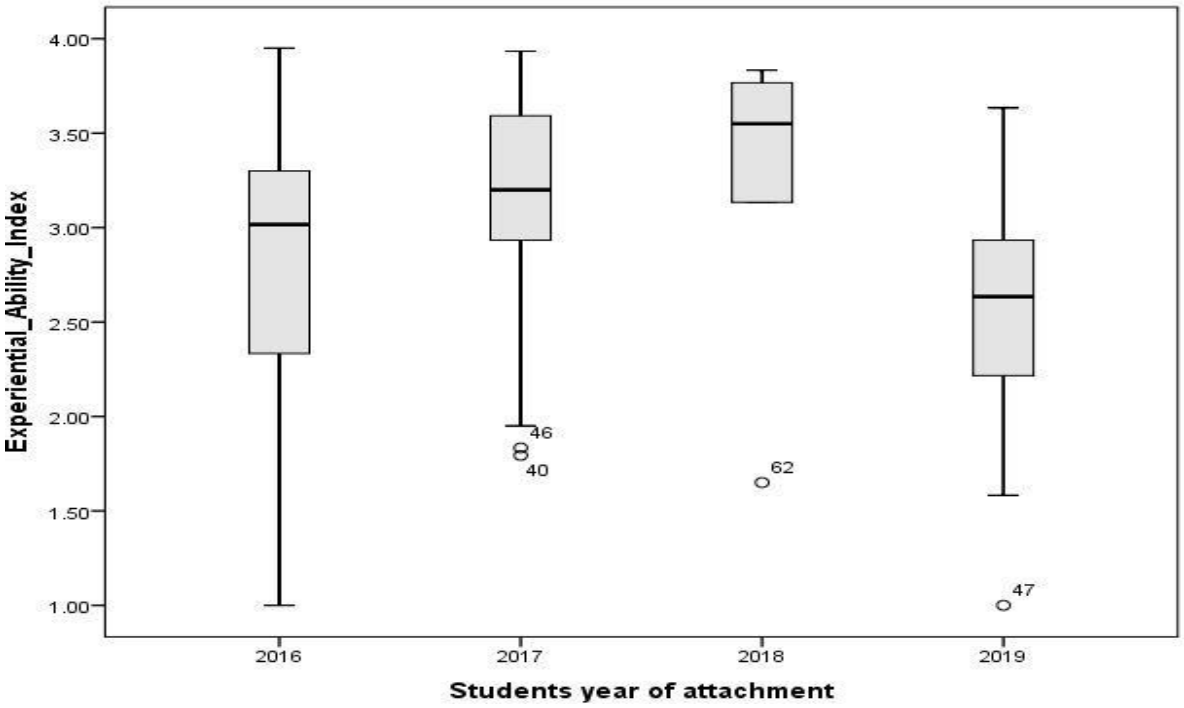


Figure 33. The effect of year of attachment on experiential learning ability

4.3.2 Effects obtained on ELA with each of the host farmer's attributes

Exploration was done to assess the effect of Farmers' attributes on ELAs. These attributes included:

I) age of the farmer, ii) education level iii) farming system and iv) level of income. Boxplots in Figure 34 were plotted to show the directional effect of the farmer's attributes. The results showed that students hosted by middle income affected ELAs more positively than either the high-income farmers or the low-income farmers. However, those hosted by high income farmers rated better than those in low-income households. This agrees with the discussions

that came out of the FGDs where some students hosted by low-income farmers narrated of how they used to travel to their own homes to bring some food to support the host farmer and this affected their willingness to get actively involved in the farm experiences. Some students hosted by high income farmers reported that their host farmers were extremely busy and not available to guide students. The students reported that they were left under the supervision of farm managers. Some of the managers, the students reported, were not very enthusiastic in organizing the students learning schedule and the some said this was frustrating and may have affected their willingness to get actively involved in the farm experiences or reflecting on what was learnt.

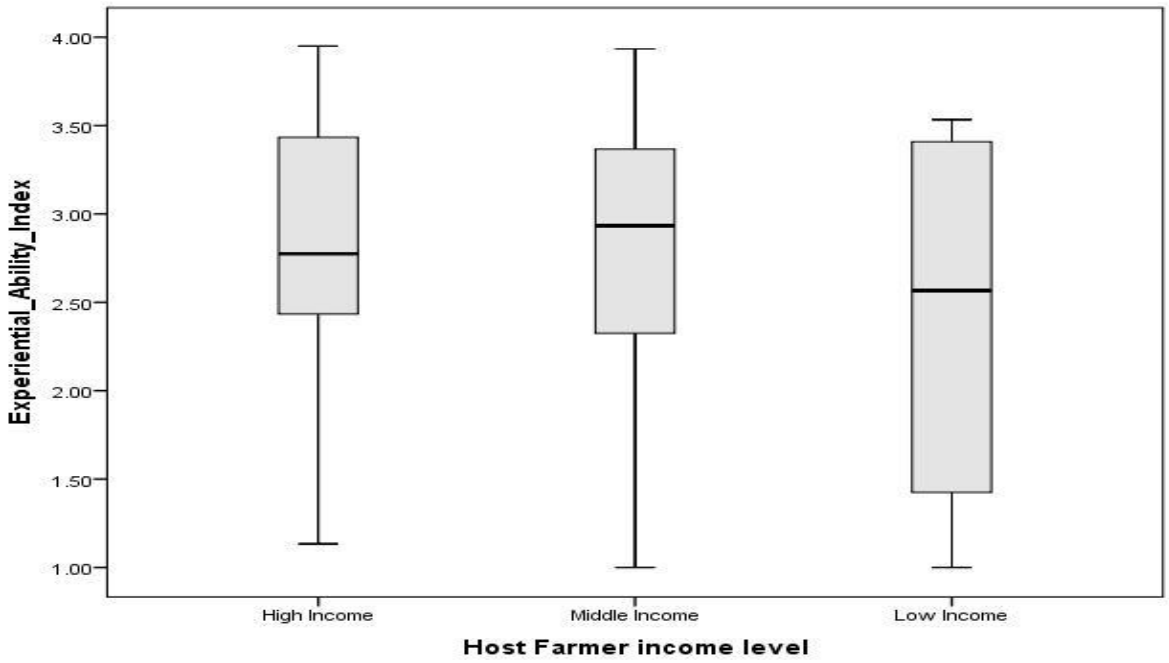


Figure 34. Effect of income level of the host farmer on experiential learning ability

4.3.3 Effects of FAP structure and implementation attributes on ELAs

The ratings for FAP structure and implementation were compounded, recoded and categorized into three levels of low, moderate and high levels of structure and implementation in SPSS. Boxplots shown in Figure 35 and 36 respectively were then drawn to see the directional effect of FAP structure on experiential learning ability. The results showed that both FAP structure and FAP implementation attributes had some effects on experiential learning ability.

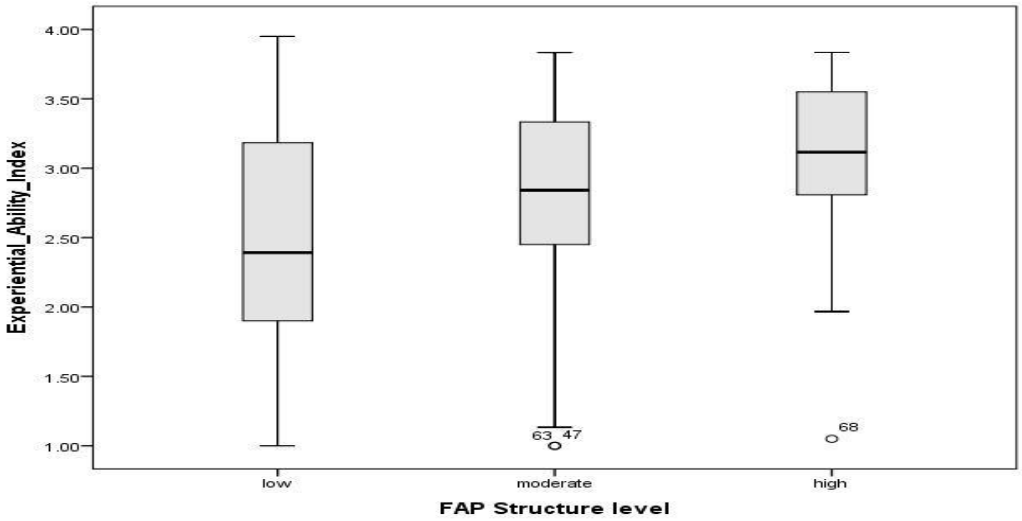


Figure 35. Effect of FAP structure attributes on ELAS

Low levels of FAP structure coincided with low levels of ELAs. High levels of structure matched with high levels of ELAs. This implied that if FAP structure was enhanced, it would have positive effects on the experiential learning abilities among the students. On the other hand, if not properly structured then this was likely to lower the students experiential learning ability levels. Proper structuring of FAP results to more willingness of the students to get actively involved in the learning experiences, students becoming more reflective, analytical and they become better placed to solve problems and make decision in the farm. It also meant that students are able to make continuity arrangements for projects/ innovations initiated in the host farm. Boxplots were also plotted for students experiential learning ability against the FAP implementation levels. High levels of FAP implementation coincided with high levels of experiential learning ability. Therefore, if well implemented FAP can improve levels of experiential learning ability. Figure 36 shows the directional effects between FAP implementation and experiential learning ability.

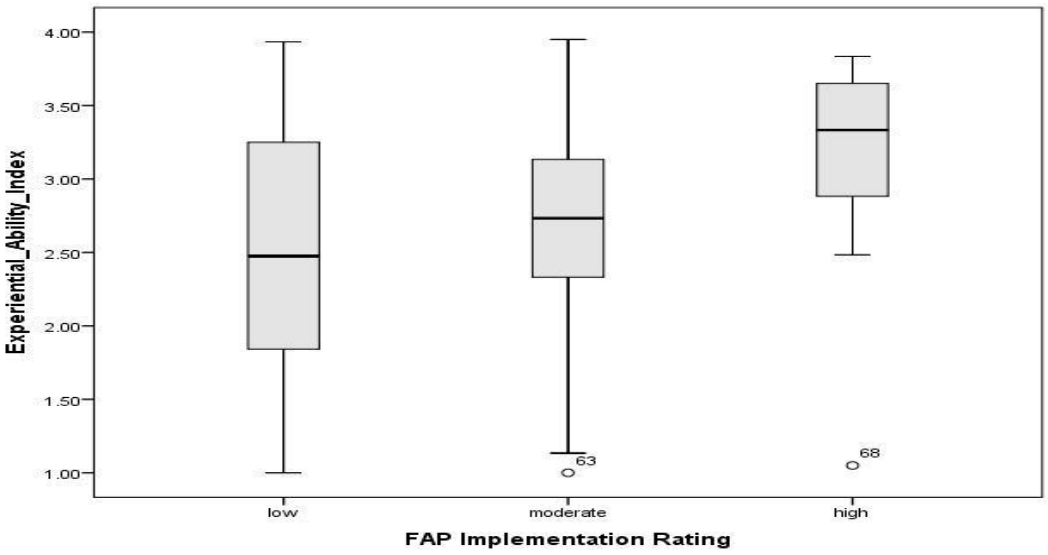


Figure 36. Effects of FAP implementation attribute on experiential learning abilities

4.3.4 Effects of farm experiences on students' ELAs

Students were asked to narrate their farm experiences and explain how the experiences affected their practicum competences (ELAs) during Focus Group discussions. the following are some of the narrations gathered from the students. Some praised their farmers for receiving them well. There are those who provided food and shelter. Others provided food but not shelter while others provided nothing. Some students were so excited and said," *We are treated like kings in the farm. We eat three course meals, sleep in comfortable rooms and TV is provided! Probably it's because our host farmer is a woman*" they concluded that the experience motivated them to get actively involved in the farm experiences. Some students narrated of how they had started introducing new ways of cooking and assisting the farmers' wives. Some said they had introduced new crops to the host farms

However, for some, life was not as easy. One student narrated the following about the situation in his host farm, "*I am treated as a casual labourer and do the same jobs with the rest of the farm workers. The only difference comes during payment of wages because I do not get a single shilling when other casual labourers receive their pay. This affects my interest in participating in the farm activities. I feel I am being exploited"*. Such situation is likely to affect the student's willingness to be actively involved in farm activities as well as their abilities to make continuity arrangements for projects initiated in the host farms because the student continued to say, "*It is difficult to instruct the workers concerning plans of projects I want to initiate in the farm because of the way I am treated by the host farmer in the presence of other casual workers" .My supervisor may not know what is happening because they only*

visit once during FAP. This agrees with Bandy (2011), who posited that, visits by lecturers during field placements are important for the purpose of ensuring that students are engaged in various aspects of work that are relevant to their occupational areas.

Some three students narrated their first day experience during the focus group discussions. They reported how they were given a task, they thought was not very appropriate to them. "*The manager requested us to hold a sick cow in an upright position, I think the cow was suffering from milk fever and could not stand*, one of the students said*. We were asked to hold the cow in a standing position for more than two hours!! we were very hungry. No food is given to us in the farm, yet we leave the farm at 4pm every day, we can't wait to complete the FAP programme*" They continued to say that this treatment affected their willingness to participate in farm experiences. Yet another student said *"My host farmer is very unpredictable, sometimes I walk in the farm and he pretends he has not seen me, he does not talk to me. So, I am left thinking through the previous day's events to try and see what I might have done wrong"*. Every student had an experience to narrate and this was a very interesting session of the focus group discussion. Some students said they could not understand the local language and sometimes they suspected they were gossiped about by the farmers and their families, making them very uncomfortable. This not only affected their willingness to participate in the farm experiences but also their abilities to solve farm problems and make decisions.

Other farmers were too excited to have female participants posted in their farms. They were so proud of them that every time they attended meetings in towns, they requested for the female student accompaniment and this did not auger well with the farmers' wives. Some students said that their host farmers were living in poverty and students would donate their own money to supplement meals cooked. Students narrated of how they would collect foodstuffs from their own parents to assist the host farmers. Yet, some farmers' wives had some excitement in that they delegated most of the house chores like cooking and looking after the babies to the female students hosted in their farms. Some students said they had solutions to most farms' problems, unfortunately the host farmers chose not to adopt their ideas, claiming that the farmers were "too knowledgeable" to take student's advice. sometimes the farmers would be willing to utilize the ideas but the they lacked resources to implement the good ideas. This, the students said, affected their abilities to solve farm problems and make appropriate decisions.

Another student said "*My host farmer uses food as bait to have me work for many hours in his farm. Lunch is served very late (3-4pm). This ensures that as I wait for the food I continue working in his farm. I am planning on how to begin cooking for myself to acquire my freedom*" This, he said, affected his willingness to participate in farm experiences.

In conclusion, the narrations gave a clear indication that the students who were hosted by caring farmers were more willing to get actively involved in the learning experiences and those that were not treated well, were not as willing.

4.3.5 Effects sizes obtained on ELAs with each FAP design attributes

A general linear model was run to estimate the effects size obtained on ELAs with FAP design attributes.

The students' prior knowledge indices were run against the Experiential learning ability indices for FAP in SPSS. The results showed that total knowledge index could explain 8.9% of the variation in ELA index. A linear regression was again fitted to determine the effect sizes of gender but first the categorical gender variable was transformed into a scale variable by creating dummies (Male dummy). The dummy was fitted in the linear regression and effect sizes estimated. The results in Table 32 showed that the effect of gender on experiential learning ability was statistically significant (F (1,96) =4.466, p=.037). Gender accounted for 4.4 % of the variability observed in the students' experiential learning ability.

Table 32

Effect size of Students' prior knowledge and gender on experiential learning ability

Tests of Between-Subjects Effects

Dependent Variable: Z score: Experiential Ability Index

Source	Type III Sum of Sqs	df	Mean Square	F	Sig.	Partial Eta Sq.	R Sq	Adj Rsq
Agric Knowledge	7.630	2.00	3.820	4.100	0.020	0.089	0.089	0.060
Std Error	87.530	94.000	0.930					
Gender (Male_ dummy)	4.310	1.000	4.310	4.470	0.030	0.044	0.044	0.030
Std Error	92.690	96.000	0.970					

A general linear model was run to determine the effect sizes of students' academic departments on variations in ELAs. The results shown on Table 33 revealed that the students ELAs were positively and significantly affected by belonging to the following departments; Agricultural education and Extension [F (1,92) = 8.232, p = .005)], Animal Science [F (1,92) = 8.379, p = .0005)] and Crop horticulture and soils department [F (1,92) = 4.452, p = .037)]. The academic departments could explain .144 (R squared) which is equivalent to 14.4%; with an Adjusted R squared= .097 interpreted as 9.7%, of the variation observed in students ELAs.

Table 33

Effect size of Students' academic departments on experiential learning ability

Tests of Between-Subjects Effects

Dependent Variable: Experiential_Ability_Index

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.663a	5	1.533	3.088	0.013
Intercept	223.469	1	223.469	450.209	.000
Dep_Agec_dummy	1.782	1	1.782	3.589	0.061
Dep_Crop_Dummy	2.213	1	2.213	4.459	0.037
Dep_Comdev_Dummy	0.885	1	0.885	1.783	0.185
Dep_Ansc_Dummy	4.159	1	4.159	8.379	0.005
Dep_Aged_Dummy	4.086	1	4.086	8.232	0.005
Error	45.666	92	0.496		
Total	819.001	98			
Corrected Total	53.329	97			

a R Squared = .144 (Adjusted R Squared = .097)

The host farmers attributes were transformed from categorical variables by creating dummies and a general linear model run to estimate the effect sizes of the attributes. The results showed that the income level of the hosting farmer had significant [F (5,98) =1.756, p=.013; R Squared = .089) effect on the students ELAs. The income levels were grouped into four categories; high income, middle income, low income and others. The age, the system of farming (whether large- or small-scale farmers), and education level of the host farmers did not have any significant effects on the students experiential learning abilities. Table 34 shows the output of the general linear model. There were a positive and significant effects on ELAs for students hosted by middle [F (1, 98) = 4.881, p =.003)] and high income [F (1, 98), p = .041)] level farmers.

Table 34

Effect size of host farmers' attributes on experiential learning ability

Tests of Between-Subjects Effects Dependent Variable: Experiential_Ability_Index					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.645a	5	0.929	1.756	0.13
Intercept	146.651	1	146.651	277.132	0
H_income_1	2.265	1	2.265	4.28	0.041
M_income_2	2.583	1	2.583	4.881	0.03
L_income_3	1.762	1	1.762	3.33	0.071
Error	48.684	92	0.529		
Total	819.001	98			
Corrected Total	53.329	97			
a R Squared = .087 (Adjusted R Squared = .037)					

The effect sizes of FAP structure and implementation on the students' experiential learning abilities were analyzed using a general linear model and results displayed in Table 35. The outcome of the analysis revealed that FAP structure's effects was significant (F (2,94) =4.3.9, p=.016) and it accounted for η_p^2 =.084 which is equivalent to, 8.4 % of the variability observed in the student's experiential learning ability. The effect of FAP implementation on ELA, was also found to be highly significant (F (2,94) =8.251, p<.001) and was responsible for 14.9% of the variability observed in the students' experiential learning ability. This is categorized as a medium effect size.

Table 35

Effect size of FAP structure and implementation on experiential learning ability

Tests of Between-Subjects Effects Dependent Variable: Z score: Experiential Ability Index						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
FAP Structure index	8.142	2	4.071	4.309	0.016	0.084
Error	88.81	94	0.945			
FAP Implementation index	14.478	2	7.239	8.251	0.000	0.149
Error	82.474	94	0.877			

The significance observed in the effect of FAP structure and Implementation on the students' ELAs revealed that probably enhancements in these areas were likely to improve students' experiential learning abilities. For instance, during focus group discussions, it was clear that students minded to a large extent the way they were matched with the host farmers. They indicated that they would have learnt more if they were posted to farms with enterprises, they had knowledge about. They also complained of lack of preparation in writing good field attachment reports. Some claimed that they had not been taken through the process of report writing and this affected their ability to write good reports resulting in unwillingness to participate in learning experiences, low levels in reflecting and low ability to be analytical in their learning experiences.

4.3.6 Summary of the baseline survey analysis

In order to design an appropriate intervention to enhance FAP and improve student's practicum competences, the findings obtained from the baseline survey, were considered. Two objectives were targeted in the baseline survey. i. To characterize the design attributes of Farm Attachment Programme (FAP) of Egerton University to show areas of improvement and ii.) Assess how practicum student competencies (ELAs) were affected by FAP attributes among students of Egerton University. This study considered the following FAP attributes i) the host farmers', the students' and lastly FAP structure and implementation attributes.

The results of the baseline survey revealed that the host farmers were engaged in various farm enterprises including livestock and crops and they needed agribusiness and agricultural

engineering services in order to produce and manage the livestock effectively. The livestock enterprises were characterized by dairy, sheep, goats, poultry, pig, and fish farming. The dairy breeds that were commonly found in FAP farms were dairy breeds (Friesian breed and cross breeds were kept by majority of the farmers. Other breeds were: Ayrshire, guernsey and jersey breeds. In poultry farming, majority of the farmers specialized in rearing indigenous breeds of poultry. Exotic breeds like layers and broilers were only reared by a small percentage of the host farmers. Only a small percentage of farmers reared pigs and fish. The crop enterprises that were common among the farmers participating on FAP were: maize, cabbages, beans, onions, kales, Irish potatoes barley, garden peas and carrots.

Some attributes of the host farmers were assessed the age of the farmer, the education level of the farmer, the income levels of the farmer and the farming system (large- or small-scale farming) employed by the farmers. Majority of the host farmers were aged between 41 to 50 years; it is important to consider the age of the host farmer. Literature reveals that the productivity of the farmer reduces significantly from the age of 65 by 11% and that productivity is at its highest between the ages of 35-45 years of age. Most of the host farmers were found to be small- and large-scale farmers. Literature review showed that most decisions in the small-scale farms are made by the host farmers and there was a need therefore to empower by giving the opportunity to solve problems and make decisions. Majority of the farmers were university graduates; it is important to consider the rate of diminishing marginal productivity in farming which has been associated with higher levels of education beyond tertiary education.

To characterize students' attributes, descriptive statistics were employed, first on prior agricultural knowledge, then on students' gender, study programmes, academic department, faculties and student's year of attachment. This was important in the study as it helped to identify the knowledge gaps that existed among the students. Majority of the students reported that they needed knowledge in Livestock, crops, agribusiness management/ economics and agricultural engineering. This, in addition to knowledge on the enterprises contributed in a big deal the content that was packaged in the proposed intervention. The knowledge areas that students requested for help in included: zero grazing, diagnosis of livestock diseases, livestock nutrition, management of dairy animals, pigs, fish and poultry. A few said they needed knowledge in beekeeping. In addition, students sought for knowledge and information

in the following areas of crop production; crop pests and diseases, production of field crops, soil sampling and analysis, weeds and weeds control, plant breeding, Registered products that should be used to control pests and diseases among other knowledge areas. In agribusiness the students identified value additions, input supply, marketing of farm produce, record keeping and farm management as areas they needed enhancement in. In agricultural engineering the following topics were identified as essential: farm structures, tools and equipment and tractor operations and farm machinery. The students reported that the available sources of knowledge were not adequate. In addition, their lecturers and agricultural field officers were not always available for consultation when needed. Internet which was a good source of knowledge was inaccessible due to high cost of internet bundles in addition to lack of specificity in knowledge provision to address local situations.

The second student's attribute was the gender. Majority of FAP students were males. This meant that it was important to consider any gender differences in experiential learning during the design of the intervention. Most of the students who participated in the FAP were enrolled in the BSc animal science study programme and there was need to encourage participation from other study programmes especially in BSc Agricultural Engineering who had no representation at all. Other study programmes whose representations were low included: Diploma in animal science, BSc Animal Health, Diploma in Agricultural Education, BSc in Aquatic Science, diploma in Horticulture and BSc in Community Studies. It was important to examine the factors that resulted to minimal participations in these departments. The faculty of agriculture was well represented and this was appropriate because majority of the host farmers requested for students with knowledge and skills in agriculture. Most of the students were drawn from the year 2019 and the least participants came from the year 2018. It is important to consider different group dynamics that exist in different cohorts to ensure good participation in FAP for all years.

To characterize FAP structure and implementation, the usefulness of the induction workshop came out after data analysis. The induction workshop usefulness was rated highly by the majority of the students. This is one attribute that was structured within FAP by the university and should continue as organized by BUGs in Egerton University. During the workshop, a training should be included that will expose the FAP students to the interventions developed in this study to enhance experiential learning. The host farms with the help of the students

should be encouraged to carry out job and task analysis so that the jobs and tasks available in every farm are documented. Students should then be allowed to choose their FAP host farms based on the types of jobs and tasks available in those farms. The students said they needed to prepare for lecturers a day before the farm operations were carried out. There was therefore a need to make a requirement that every student prepares a job operation sheet to guide in the job execution. This would give students ample time to prepare in advance for tools, materials and equipment needed the job operations executed in the day that followed. FAP implementation index was rated low which implies that the students should be guided on how to conduct job and task analysis and prepare daily job sheets for use during the daily routine operations.

To characterize FAP attributes further, ELA index was determined by measuring the constructs adopted form Kolbs (1984). They included; willingness to become actively involved in the farm learning experiences, ability to be more reflective, ability to analyze learnt experiences, ability to solve problems and make decision, and ability to make continuity arrangements for initiated projects/innovations. Generally, the experiential learning ability index was found to be low (M= 2.97, SD= 0.51). There was a need to improve students': willingness to become actively involved in the farm learning experiences, ability to be more reflective, ability to analyze learnt experiences, ability to solve problems and make decision, and ability to make better continuity arrangements for initiated projects/innovations.

The second objective was to assess how practicum students' competences were affected by FAP attributes. The results of the analysis showed that the following FAP attributes had significant effects on the students ELAs; students' level of prior knowledge in agriculture which was highly significant; academic departments that students were drawn from, students from Aged & Extension, animal science and crops, soils and horticulture were found to have significantly higher levels of ELAs than students from other departments; the student's gender had significant effect of ELAs. The farmers level of income had a significant effect of students ELAs. Positive and significant effects on ELAs were obtained for students hosted by middle- and high-income earning farmers. FAP structure and implementation attributes had positive and significant effects on students ELAs. Therefore, it was important to consider various FAP design attributes and how they affected ELAs (willingness to get actively involved in the farm learning experiences, ability to; reflect, analyze, solve problems and

make decisions and at the same time make continuity arrangements for initiated projects/innovation. The FAP attributes found to be critical because they had a positive and significant effect on ELAs were students'; prior knowledge in agriculture, gender, academic programme, host farmers' income levels and finally the structure and implementation attributes of FAP.

Following the detailed analysis of FAP attributes, a DKP innovation was created through in collaboration with 2019 cohort through a participatory approach. DKP weekly structure, DKP student's portfolio, DKP implementation enablement and DKP resources were designed and referred to in this study as DKP innovation design attributes. To encourage students' willingness to get actively involved in the farm experiences, DKP weekly structure was created. To encourage reflective nature of the students in their learning experiences, a student's portfolio was added to DKP where students would record what went on well and what did not go on so well. Encouraging students to reflect on what they learnt by making the writing of a field attachment report of high quality was necessary. This is already done in the current structure of FAP. To provide agricultural knowledge to students on FAP, there digital resources for references were created. Students complained of the bulky nature of textbooks and their lecture notes and digital resources could be used to address those challenges. In the current set up, students are advised to use the internet and consult their lecturers but students have always complained of the high costs of internet bundles and unavailability of their lecturers. In designing the intervention therefore, these factors were considered in order to enhance FAP.

4.4 Integration of DKP innovation attributes into FAP and its effects on ELAS

The third objective of this study was**:**

To explore how DKP innovation design attributes integrated into FAP affected ELAs among practicum students in Egerton University

This section is divided into two. The first section aimed at exploring the levels obtained on ELAs after integrating DKP innovation into FAP among Egerton university practicum students. The second section is an assessment of the effects on ELAs obtained with each DKP innovation design attributes. A detailed description of how each of the DKP attributes were designed is given in the methodology section, chapter three.

4.4.1 Levels obtained on ELAs with DKP innovation attributes

The students who participated in the action phase of the study were asked to rate indicators of ELAs including; willingness to get actively involved in the farm experiences as a result of using the DKP. They were also asked to rate their abilities to reflect, analyze, solve problems, make decisions and make continuity arrangements as a result of using the DKP. The results in Table 36 showed that the overall ELA level after DKP integration was high (M=4.07, SD= 0.13).

Table 36

DKP experiential learning ability indicator levels

DKP Experiential learn. ability indicators	N	Min	Max	Mean	Std. dev	Rating
DKP Rating on Reflection	30	3	5	4.27	0.58	high
DKP Rating on decision making	30	2	5	4.2	0.89	high
DKP Rating continuity arrangement	30	2	5	4.1	0.71	high
DKP Rating on problem solving	30	1	5	4	0.95	high
DKP Rating on willingness	30	3	5	3.97	0.76	moderate
DKP Rating on analyze	30	2	5	3.87	0.82	moderate
DKP experiential learning Ability Index	**30**	**1**	**5**	**4.07**	**0.13**	**high**

Upon determination of the overall students ELA after integrating the DKP, there was need to find out the levels of ELAs obtained with each DKP design attribute. Students were asked to rate the indicators for DKP innovation attributes on the basis of contribution towards improvement of the their ELAs. Following are the level assessments of the four innovation attributes of the designed DKP: Weekly Structure, Student Portfolio, DKP Implementation Enablement and DKP Resources

a. Levels of ELAs obtained with DKP weekly structure attribute

To determine the levels of the DKP weekly structure attribute to improve ELAs, students were asked to rate the constructs shown in Table 37 to measure the variable. The mean rating

for the indicators were then compounded to obtain the overall DKP weekly structure index. The results showed that making reflection on learned experiences as a result of using power point presentations structured in the DKP, was rated highest (M= 4.43, SD = 0.63). The ability to make continuity arrangement for initiated projects as a result of using the power point presentations in the DKP was rated lowest (M=3.50, SD =1.11). There is need to find out why the rating for making continuity arrangement and ability to analyze farm experiences were rated lower than other indicators by the students. Probably the students did not have the skills to use some of the packaged resources like statistical software provided in the DKP or they did not do any analysis at all. During the focus group discussion, the students reported that it was difficult to make continuity arrangements because of the way some farmers treated the students in presence of other farm workers. There is need to find out other factors that made it difficult for students to make continuity arrangements for projects / innovations they initiated in their host farm. Another explanation may be that the students did not initiate any project or innovation at all.

Table 37

Ratings of indicators for DKP's weekly structure

Descriptive statistics

DKP's weekly structure rating	N	Min	Max	Mean	SD	Rating
PPT on ability to reflect	30	3	5	4.43	0.63	High
PPT solve problems and make decisions	30	2	5	4.30	0.70	High
PPT willingness to be involved in experiences	30	2	5	4.13	0.86	High
PPT and ability analyze farm experiences	30	1	5	3.77	0.86	Moderate
PPT ability_ make cont. arrangement_ projects	30	1	5	3.50	1.11	Moderate
Overall Rating on DKP weekly structure	30	1	5	4.03	0.18	High

b. Levels of ELAs obtained with DKP Students' portfolio attribute

To determine the rating for the student's portfolio a descriptive analysis was run and the results are as displayed in Table 38. All the indicators of student portfolio attributes that were

found to be significant have been outlined. The first activity outlined in the students' portfolio was to take a tour in the host farm within the first week of reporting and reflect in the portfolio the jobs available in the host farm. The results of the analysis shows that this activity was rated highest (Mean=4.33, min=3, max=5, SD=0.80). Probably the students found the activity easy to do and reflect on. It may also have been a useful activity because it exposed the students to the realities in the farm. Preparing jobsheet and the willingness to be actively involved in the farm experiences was also rated highly (M = 4.20, SD =0.55) as a result of making reflections on learnt experiences. It would be good to find out why conducting job analysis from identified farm jobs was rated the lowest in comparison to other students' portfolio attributes. It is important to note that in the current structure of FAP students are not required to carry out job analysis and this was something unfamiliar with the students. This may explain the low (M=3.83, SD = 0.95) rating of the activity.

Table 38

DKP student's portfolio attribute indicator levels

Student portfolio indicators	N	Min	Max	Mean	SD	Rating
tour identify job _reflection	30	3	5	4.33	0.80	High
Jobsheet _willingness	30	3	5	4.20	0.55	High
job analysis index	30	1	5	4.20	0.96	High
job analysis _problem solve make decision	30	2	5	4.20	0.89	High
task analysis_ index	30	2	5	4.13	0.90	High
portfolio jobsheet Index	30	2	5	4.13	0.90	High
job analysis _willingness	30	3	5	4.10	0.84	High
task analysis _analysis	30	2	5	4.10	0.96	High
Tour _problem solve make decisions	30	2	5	4.10	0.92	High
job analysis _reflect	30	3	5	4.07	0.69	High
job analysis _continuity arrangement	30	2	5	4.07	0.94	High
task analysis _willingness	30	3	5	4.03	0.72	High
Jobsheet _analysis	30	2	5	4.03	0.89	High
task analysis _reflect	30	1	5	4.00	1.05	High
tour identify job _analysis	30	1	5	4.00	1.02	High
job analysis _analysis	30	2	5	4.00	0.91	High
task analysis _problem solve make decisions	30	1	5	3.97	1.07	moderate
Jobsheet _problem solve, make decisions	30	2	5	3.93	0.98	moderate
Farm identification _job analysis	30	2	5	3.83	0.95	moderate
Student's Portfolio index	30	1	5	4.08	0.21	High

Overall, the student's portfolio index was determined by compounding all the ratings from the student portfolio indicators and calculating the mean (M=4.08, SD = 0.21). This was taken as students' portfolio index.

c. Levels of ELAs obtained with DKP implementation Enablement attribute

Table 39 shows the indicators used to measure DKP implementation enablement i.e., the training workshops, the hyperlinks and the DKP online google platform. The overall DKP

implementation was rated as moderate. Some students had difficulties accessing the online google group and some never posted anything or asked any questions. This may have explained the low rating recorded for this indicator. Although money to buy bundles was provided to students so that students would access the online google groups, they had other needs and some may have used their money in other ways. The best way to provide internet bundles would be probably in kind but not in cash.

Table 39

DKP implementation attribute indicator levels

DKP implementation _ indicators	N	Min	Max	Mean	SD	Rating
DPP google platform	30	1	5	3.47	1.14	moderate
DKP navigating student portfolio	30	2	5	3.8	0.76	moderate
DKP Links _ EL	30	2	5	4	0.74	High
DKP_ training workshop	30	2	5	4.2	0.92	High
DKP _ navigating resources	28	3	5	3.89	0.69	moderate
DKP Implement Willingness	28	3	5	4.07	0.86	High
DKP implement_ Reflection	28	4	5	4.43	0.5	High
DKP implement_ analyze	27	2	5	3.67	0.73	Moderate
DKP Implement _solve. problems	28	1	5	3.93	0.98	Moderate
DKP Implement _ continue arr.	28	2	5	4.07	0.9	High
DKP implement_ enable Index	27	1	5	3.95	0.18	Moderate

It was noted during the workshop that some students were not conversant with such platforms as online google platform and the lower rating in comparison with other DKP implementation attributes would be pegged on inability by the students to use the online platform. The training workshops were rated high M =4.60, SD= 0.92) by majority of the students. This was a face-to- face workshop and students interacted and asked questions freely. They also worked in groups to practiced preparation of DKP documents including jobsheets, job and task analysis etc.

d. levels of ELAs obtained with DKP resource attribute

To determine the levels of DKP resources as rated by the students. various indicators shown in Table 40 were measured on a 5point scale with a minimum of 1 and a maximum of 5. The overall rating for the DKP resource index for resource attribute was high (M=4.02, SD =0.14).

Table 40

Indicator levels for DKP implementation enablement variable

DKP Resource indicators	N	Min	Max	Mean	SD	Rating
Resource disease and pest identification _Ref.	30	3	5	4.37	0.56	High
crops production resources _Willingness	30	3	5	4.23	0.73	High
livestock production resources _solve Problems	30	3	5	4.23	0.68	High
livestock production resources _willingness	30	1	5	4.10	0.80	High
crops production resources _solve problems	30	3	5	4.10	0.61	High
Agribusiness resources _Reflection	30	3	5	4.03	0.76	High
livestock production resources _Reflection	30	1	5	4.03	0.81	High
[Availability of video resources _exp ability	30	1	5	4.03	0.89	High
DKP Resource indicators Index	30	1	5	4.02	0.14	High
Agribusiness resources _willingness	30	2	5	4.00	0.98	High
registered products _willingness	30	2	5	3.97	0.93	Moderate
resources on disease/pest ident _solve problems	30	1	5	3.93	0.83	Moderate
resources on reg. products _solve problems	30	1	5	3.93	0.74	moderate
resources on registered products _Reflection	30	1	5	3.87	0.97	Moderate
crops production resources _Reflection	30	2	5	3.87	1.04	Moderate
Agribusiness resources _solve problems	30	2	5	3.60	0.86	moderate
DKP Resources index	30	1	5	4.02	0.21	High

The agribusiness resource's rating for ability to solve problems were rated lowest (M=3.60, SD =0.86). Majority of the students were directly involved with the framing activities in the production process and probably not much references were made to agribusiness resources and hence the low rating. Resources on disease and pest's identification were rated highest (M= 4.37, SD = 0.56). Probably these were the most widely used resources going by the questions posted by the students in the online google group. Most students wanted to know how they could identify pests and diseases and make recommendations for registered pest and disease control products to their host farmers.

4.4.2 Effects of FAP design moderator variable on ELAs (after DKP integration)

In order to confirm effective control of the moderator variable, FAP design attribute indices were regressed against the ELA indices (after DKP integration) in a general linear regression. The attributes included dummy variables of department, Knowledge levels, and gender. The results showed that there was no significant effect of the moderator variables on students' ELAs. This means that the moderator variable had been controlled effectively in the study design. Any other effect observed in students ELAs was assumed to be as a result of the DKP innovation attributes. Table 41 is the output of test effects between the students' attributes and the ELA (after DKP) indices. There was no significant [F (1,29) = 1.646, p =.210) effect between the two variables thus indicating effective control of the moderator variable in the study design.

Table 41

Linear regression between students' attributes moderator variables and ELAs (after DKP)

Tests of Between-Subjects Effects

Dependent Variable: ELA (after DKP)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.032a	2	0.516	1.102	0.347	0.075
Intercept	441.979	1	441.979	944.742	0.00	0.972
High knowledge	0.718	1	0.718	1.535	0.226	0.054
Low knowledge	0.001	1	0.001	0.002	0.967	0.000
Corrected Model	.949a	2	0.474	1.007	0.379	0.069
Intercept	380.266	1	380.266	807.531	0.000	0.968
Dept _ Agec	0.092	1	0.092	0.195	0.662	0.007
Dept_ Aged	0.175	1	0.175	0.371	0.548	0.014
Corrected Model	.759a	1	0.759	1.646	0.210	0.056
Intercept	292.136	1	292.136	633.876	0.000	0.958
Male _dummy	0.759	1	0.759	1.646	0.210	0.056
Corrected total		29				

Another general linear model was run to test if the level of income for the host farmer had a significant effect on students ELAs after DKP integration. The output of the analysis is shown

on table 42. There was no statistically significant [F (1,29) = .510, p =.606)] effect between the moderator variable and the ELA index after DKP integration. Proving that the moderator variable (level of income of the host farmer) was effectively controlled in the study design.

Table 42

General linear regression between income level of host farmer and ELAs (after DKP)

Tests of Between-Subjects Effects						
	Dependent Variable: ELA (after DKP integration)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.497a	2	0.249	0.510	0.606	0.036
Intercept	92.956	1	92.956	190.63	0.000	0.876
Income_1	0.495	1	0.495	1.015	0.323	0.036
Income_3	0.002	1	0.002	0.003	0.954	0.000
Total	504.389	30				
Corrected Total	13.663	29				

a R Squared = .036 (Adjusted R Squared = -.035)

4.4.3 Effects obtained on ELAs with each DKP design attribute

Following effective control of the moderator variables in the study design, General Linear models (GLM) were fitted to explore the effect sizes of the DKP innovation design attributes on the ELA after integration of the DKP into FAP. The output of a GLM gives partial eta squared that allows the estimation of the effect sizes of the predictor variables in addition to an ANOVA output. This study operationalized DKP weekly structure index (DWSi), DKP implementation index (DIMi), DKP student's portfolio attributes index (DSPi) and DKP resource index (DRi) as the DKP innovation design attribute indicators. The results are shown in a series of tables 43, 44, 45 and46.

Table 43 shows the effects of DKP weekly structure attributes on students' ELAs. The effect was found to be significant [F (10,29) =8.49, p=.001)]. According to the output, DKP weekly structure attribute explained 72.1% (adjusted R squared) of the variation observed in ELA, as a result of integrating DKP into FAP. This was considered a large effect size.

Table 43

Test between effects of DKP weekly structure design attribute on ELA

Tests of Between-Subjects Effects Dependent Variable: DKP Exp						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.926a	10	0.89	8.49	0.00	0.82
Intercept	323.46	1	323.46	3077.97	0.00	0.99
DWSi	8.93	10	0.89	8.49	0.00	0.82
Error	2.00	19	0.11			
Total	507.06	30				
Corrected	10.92	29				

a R Squared = .817 (Adjusted R Squared = .721)

In the same way a general linear model was ran to determine the effect of DKP student portfolio (DSPi) attribute on experiential learning ability after DKP integration. Table 44 shows the results of the analysis. The effect was found to be significant (F (20,30) =5.32, p=.01). The results also showed that DSPi accounted for 74.9% of the variability in the ELAs as a result after integrating DKP into FAP.

Table 44

Test between effects of DKP student's portfolio design attribute and DKP ELA

Tests of Between-Subjects Effects Dependent Variable: DKP Exp						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	10.070a	20	0.50	5.32	0.01	0.92
Intercept	421.99	1	421.99	4458.37	0.00	1.00
DSPi	10.07	20	0.50	5.32	0.01	0.92
Error	0.85	9	0.10			
Total	507.06	30				
Corrected Total	10.92	29				

a R Squared = .922 (Adjusted R Squared = .749)

Table 45 shows the results of a general linear model revealing the effects of DKP implementation enablement (DIMi) attribute on experiential learning ability after integrating the DKP innovation into FAP of Egerton University. The results showed that the effect of DIMi on ELA (after DKP) was statistically significant (F (9,29) = 6.95, p =.001) at 5% level of significance. The analysis also showed that DIMi accounted for 64.9% of the variation of the students' ELAs. This implies that DKP implementation enablement had a positive and significant effect on the students experiential learning ability.

Table 45

Test between effects of DKP implementation enablement design attribute on DKP ELA

Tests of Between-Subjects Effects						
Dependent Variable: DKP Experiential learning ability						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.276a	9	0.92	6.95	0.00	0.76
Intercept	352.55	1	352.55	2664.94	0.00	0.99
DIMi	8.28	9	0.92	6.95	0.00	0.76
Error	2.65	20	0.13			
Total	507.06	30				
Corrected	10.92	29				

a R Squared = .758 (Adjusted R Squared = .649)

The final analysis was done to determine the effect of DKP resource attributes students' ELAs after using the DKP. The results shown in Table 46 revealed that the effect of DKP resource attribute was significant (F (16,29) =2.86, p =.03) and could explain 50.6% of the variation in experiential learning ability among the students on FAP.

Table 46

Test of between DRi and DKP experiential learning ability indices

Tests of Between-Subjects Effects

Dependent Variable: DKP Experiential learning ability

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.503a	16	0.53	2.86	0.03	0.78
Intercept	390.41	1	390.41	2098.1	0.00	0.99
DRi	8.50	16	0.53	2.86	0.03	0.78
Error	2.42	13	0.19			
Total	507.06	30				
Corrected Total	10.92	29				

a R Squared = .779 (Adjusted R Squared = .506)

4.5 Evaluating the Effectiveness of the DKP innovation in Improving ELA Levels

The Fourth objective of this study was;

To evaluate the extent to which integration of a DKP innovation design attribute improved the ELA Levels among Egerton University students on FAP

This objective was executed in two steps. The first step was to test the hypothesis that there was no significant difference between the Students ELAs before and after integration of DKP innovation into FAP. The second step was the predict ELAs from DKP innovation attribute indices.

4.5.1 Hypothesis testing

The mean values of ELAs among three groups of students were determined and shown in table 47 i.e., the group that participated in the action phase of the study before DKP Integration onto FAP [ELA ($_{Before}$)] and after DKP integration into FAP [ELA ($_{after\ DKP}$)]. There was also a control group that never used the DKP at all, the DKP [ELA($_{FAP}$)]. Descriptive statistics were run and the experiential learning ability indices obtained. The results [(ELA$_{(FAP)}$ =2.79, SD=0.726), (ELA (before $_{DKP}$) = 2.68, SD=0.596) and ELA $_{(after\ DKP)}$ = 4.04)] are displayed in Table 47.

Table 47

Descriptive Statistics for new and old experiential learning ability indices

Analysis	N	Min	Max	Mean	SD
ELA(FAP) (Control)	102	1.00	3.95	2.79	0.726
ELA (Before DKP)	30	1.73	4.00	2.68	0.596
ELA (After DKP)	30	2.50	5.00	4.04	0.686

A two-sample *t*-test was ran to test the significance of the differences in the means at 5% level of significance. The null hypothesis was that the true difference between the means for the two experiential learning ability indices was zero, thus testing:

H_0: $\bar{x}$ *ELA (after DKP integration)*- $\bar{x}$ ELA (before DKP integration) = 0

against H_1 $\bar{x}$ *ELA (after DKP integration)*- $\bar{x}$ ELA (before DKP integration ≠ 0

The results in Table 48 shows that the observed difference between the sample means was 1.356. A 95% confidence interval for the true difference of the means was (1.005, 1.706). which means that we reject the null hypothesis in favour of the alternative hypothesis, because the data provided strong evidence against the null. The difference between ELA before and after integration of DKP was statistically significant [t (29 =7.90), p =.000)]. In conclusion, the results showed that there was strong evidence to support the claim that there was a significant difference between ELAs before and after integration of DKP innovation into FAP. The ELAs improved by 1.356 at 95% CI (1.005, 1.706).

Table 48

*Paired Samples T*est

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	ELA (before DKP) – ELA (after DKP)	-1.356	.939	.171	-1.706	-1.005	-7.900	29	.000
Pair 2	ELA (after DKP) – ELA (FAP control)	1.392	.856	.156	1.073	1.712	8.910	29	.000

4.5.2 Statistical Modelling: Equation of the Linear Regression

To predict the effect of each DKP design attributes on improvement of experiential learning abilities in FAP of Egerton University, a stepwise Multiple Linear Regression of the form y = a+b1x1+b2x2+b3x3 was used to evaluate whether DKP weekly structure index (DWSi), DKP resources index (DRi), DKP student's portfolio index (DSPi) and DKP Implementation Index (DIMi) mean scores could estimate students' Experiential learning ability index. To determine the overall fit of the model and the comparative involvement of each of the predictors to the total variance explained (Higgins, 2005) multiple regression was run. The linear regression summary model is shown in Table 49. The results showed that the predictors i.e., constant, DKP weekly structure index, DKP resources index and DKP Implementation enablement index accounted for 90.4% (Adjusted R square, coefficient of determination=.904) of the variation in the DKP experiential learning ability index.

Table 49

Model Summary

Model	R	R Square	Adjusted	Std. Error of the Estimate
1	.958a	0.917	0.904	0.21268

a Predictors: (Constant), DKP implementation Index, DKP student's portfolio index, DKP resources index, DKP weekly structure index

Anova was run to test the significance of the regression model. The results showed that the fitted model was highly significant (F (3,26) 87.410, p<.0001). This meant that a general regression model could be used based on the regression coefficients shown in Table 50.

Table 50
Anova analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.430	3	4.143	87.410	.000[b]
	Residual	1.232	26	.047		
	Total	13.663	29			

a. Dependent Variable: New DKP experiential index

Table 51 is the model summary produced to show the Pearson's correlation coefficients of the individual predictors (DWSi, DIMi, DSPi and DRi) in the regression model. The results showed that the correlation coefficients of the DKP student's portfolio and DKP weekly structure indices were not statistically significant despite the summary regression model that confirmed overall significance and adjusted R square explaining a huge amount of variance in the model. This hinted to a multicollinearity problem within the independent variables. Collinearity diagnostics, were used to check if indeed there was multicollinearity among the independent variables using Variance Inflation Factor (VIF) and a measure of tolerance of coefficients were used. Assessing VIFs is particularly important for observational studies because these studies are more prone to having multicollinearity. Multicollinearity of variables should be avoided as much as possible because of its negative impact on the analysis. According to Raykov et al. (2019), in a regression analysis, the presence of multicollinearity implies that, one is using redundant information in the model, which can easily lead to unstable regression coefficient estimates.

To detect collinearity the following measures were used; A Tolerance test (> 0.2), Variance inflation test (VIF ≤ 0.5) and Eigen values (not close to zero) and condition index values must be less than 15.

Table 51

Coefficient estimates for the regression model

There are various methods of resolving the issue of multicollinearity. One way is to restrict

	Unstandardized Coefficient		Standard. Coefficients	t	Sig.	Collinearity Statistics	
Model		B	Std. Error	Beta		Tolerance	VIF
1	(Constant)	-0.476	0.321		-1.484	0.150	
	DRi	0.557	0.130	0.517	4.293	0.000	0.240	4.17
	DSPi	0.294	0.230	0.232	1.277	0.213	0.105	9.51
	DWSi	0.266	0.205	0.244	1.300	0.205	0.098	10.18

The scope of the model to coincide with the range of predictor variables that exhibit the same pattern of multicollinearity. The second way is to drop some correlated predictor variables (ones with the highest VIF). The third way is to add data cases so as to break the pattern of multicollinearity. The fourth method is to measure some coefficients in a separate experiment (then fix those coefficients). The final method which was picked as a solution to the issue of multicollinearity in this study, was to use Principal Component Analysis (PCA) method in order to understand the collinearity in the independent variables and make the best decision on how to resolve the issue.

The primary components were used to obtain the likely direct groupings of variables that yielded a big change without losing much information. The set of interrelated variables were condensed into new number of variables that were independent on each other but contained linear combination of the related variables. In order to check for the presence of correlation between predictors, dependent variables were regressed on principal components. The results show that VIF values for each predictor ranged from 1 to 3 indicating that the multicollinearity problem was eliminated. A new linear regression was fitted using the principal components as predictors. The valuation of correlation between predictors, showed no signs of multicollinearity. According to Gwelo (2020), principal component analysis is

one of the appropriate methods of solving the problem of multicollinearity among independent variables.

4.5.3 Principal Component Analysis (PCA) for the independent variables

Using SPSS, the Principal Component Analysis (PCA) method was used to analyze the correlation of the variances found in the independent variables by first producing the correlation matrix shown in Table 52. The results showed that there was a high correlation between all the independent variables. For instance, there was a high correlation between DKP resource index and DKP weekly structure index (.864). There was a high correlation between DKP implementation index and DKP resources index (.903). The correlation between the DKP resources index and DKP student's portfolio index was .854.

Table 52

Principal component Analysis (PCA) for the independent variables

		DR*i*	DWS*i*	DIM*i*	DSP*i*
Correlation	DR*i*	1.000	.864	.903	.854
	DWS*i*	.864	1.000	.885	.943
	DIM*i*	.903	.885	1.000	.846
	DSP*i*	.854	.943	.846	1.000

Correlation Matrix[a]

To check the assumptions of the principal component analysis, sampling adequacy test was performed using Kaiser-Meyer -Olkin .and Bartlett's test of sphericity were used to test the significance of the coefficient matrix. In other words, to test appropriateness of running the correlation matrix. The results in Table 53 showed a high significance (p=.001) level. The sampling adequacy was acceptable (KMO=.807) and Bartlett's test of sphericity demonstrated that correlations between the independent variables were large enough for PCA ($\chi 2(6) = 149.968$, p=.000). The SPSS program sets KMO to .5 when the correlation matrix is identity matrix, avoiding the problem of carrying out divisions by zero.

Table 53

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.

KMO and Bartlett's Test		0.807
Bartlett's Test of Sphericity	Approx. Chi-Square	149.968
	Df	6
	Sig.	.001

KMO values greater than 0.8 can be considered as a good indication that principal component analysis will be useful in analyzing the variable in question. This occurs when most zero-order correlations are positive. KMO values are less than 0.5 when most zero order correlations are negative.

A scree plot, shown in Figure 37 was plotted to explore the number of component solutions that were available in order to resolve the issue of multicollinearity. The results produced a one component solution to the multicollinearity problem encountered in the regression analysis.

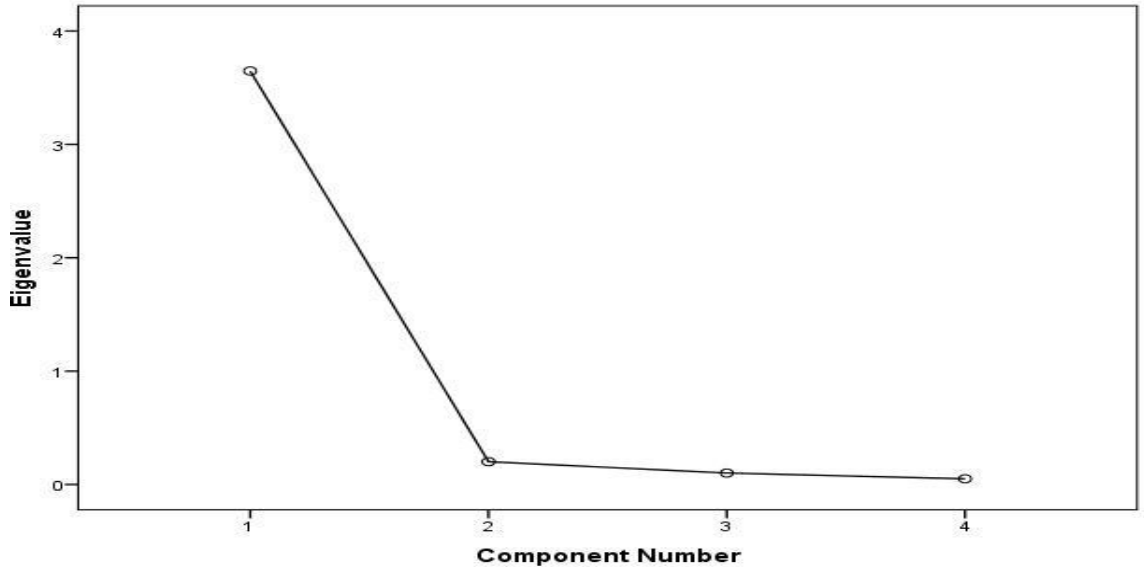


Figure 37. Scree plot showing one component solution of DKP and the DRi, DWSi, DSPi and DIMi predictor variables.

PCA was run for the four independent variables producing a one component solution that explained 91.18% of variance in the regression model. The component Eigenvalue was 3.647.

Eigen value is a non-zero scalar that has a linear transformation of a vector space which when multiplied by the scalar is equal to the vector obtained by letting the transformation operate on the vector especially: a root of the characteristic equation of a matrix. In conclusion the one component solution for the four predictor variables was taken to be a combination of all four DKP design attributes including DWSi, DSPi, DIMi and DRi attributes the four attributes were reduced to one attribute and given the name DKP Innovation Design (DIDi) attribute.

To determine the extent to which the DKP innovation integrated into FAP improved the students ELAs, the levels of ELAs for the control group and the group that used the DKP were established first. The effects of the one component solution (DID attribute) on students ELAs was determined and finally a linear regression model was run to predict levels of ELAs among the students from the one component solution of the DKP innovation.

4.5.4 Series Effects of DKP innovation design (DID) on students' ELAs

To explore the effect of DKP innovation design attribute on the students ELAs line graphs were drawn to compare the effects of the two variables on each other. The results shown in figure 38 revealed that the levels of ELAs went up after the integration of the DKP into FAP.

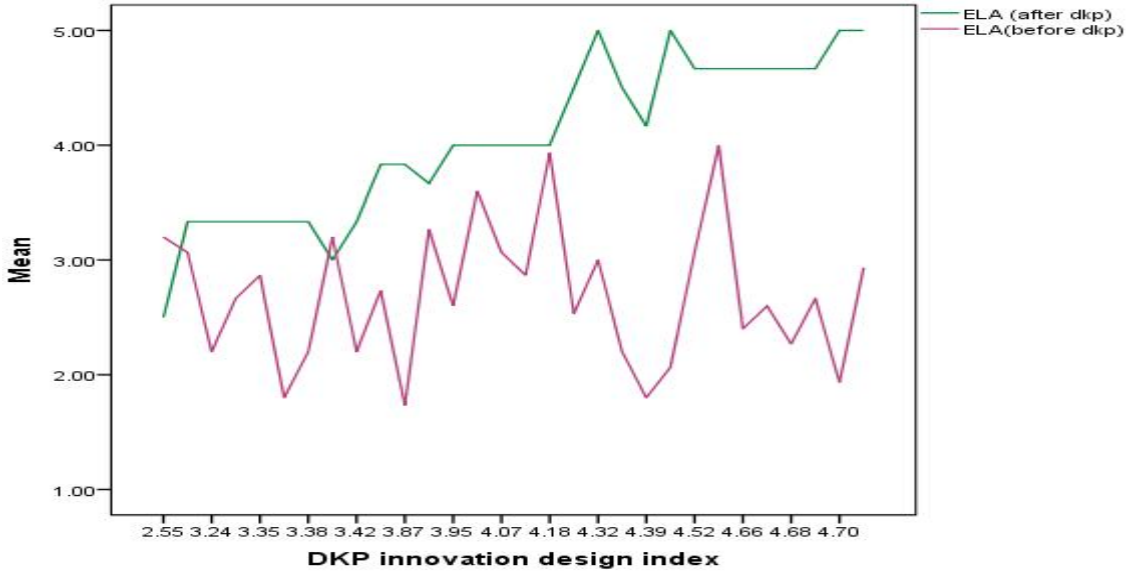


Figure 38. Effect of DKP innovation design on ELAs

A linear regression was used to investigate the relationship between student's practicum competences (ELAs) and the DID index. A straight-line regression model was fitted to the data. The resulting table of regression coefficients is shown in Table 54. The B value was

found to be 1.105 (t=17.90, p=.000).

Table 54

Regression coefficients for the straight-line regression model

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.380	.260		-1.462	.155
	DID index	1.105	.064	.956	17.190	.000

a. Dependent Variable: ELA (after DKP)

The p-value of the F-test in the ANOVA table was used to test if the true value of the slope is zero is < .0001 was statistically significant. A straight-line model explains significantly more of the variability in ELAs than the null model. The Anova output of the regression analysis is shown in Table 55. In order to illustrate the relationship between study variables, linear regression model is fitted. The independent variable of this study was DKP Innovation Design (DID) attribute, and the other is considered to be a dependent variable which is the ELA variable in this study (Sidhu, 2019).

Table 55

Anova Output

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.480	1	12.480	295.498	.000[b]
	Residual	1.183	28	.042		
	Total	13.663	29			

a. Dependent Variable: ELA (after DKP)

b. Predictors: (Constant), DKP innovation design index

R^2 shown in table for the straight-line regression model is .910. This means that over 91% of the total variability in ELAs has been explained by the straight-line regression model. The results are shown in Table 56.

Table 56

Coefficients[a] of regression model

Model		Unstandard c		Stand.c	t	Sig.	95.0% C I for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Consta	-0.380	0.260		-1.462	0.15	-0.913	0.150
	DIDi	1.105	0.064	0.956	17.190	0.000	0.974	1.237

a Dependent Variable: ELA (after DKP)

The overall equation for the regression analysis between the DID attribute index and ELA index is given by: ELA (after DKP) = -.380 + 1.105 x DID index+ 0.064 (Error). Therefore, an increase in DID attribute index is expected to raise the levels of ELAs.

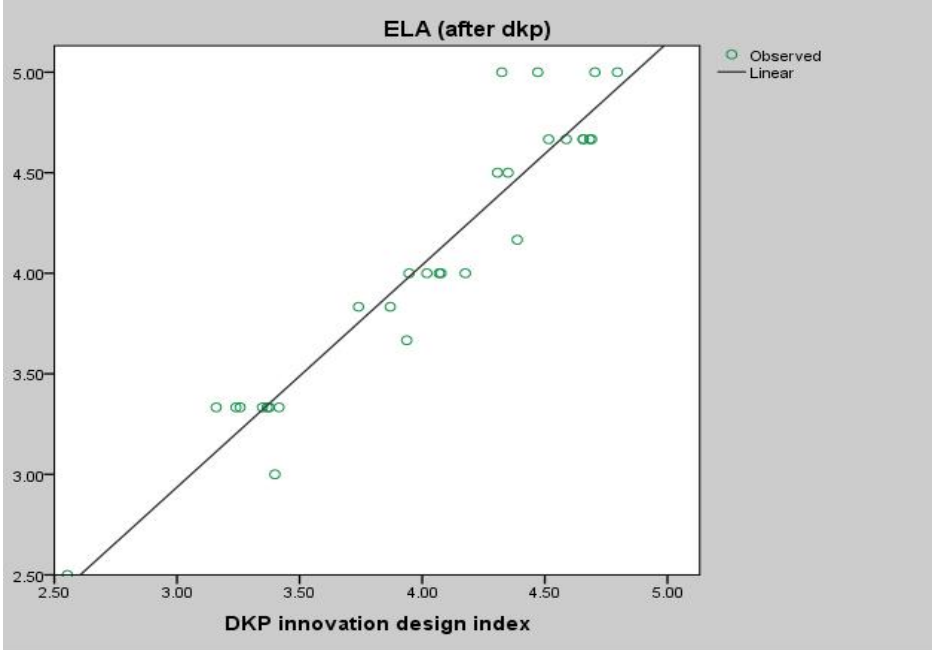


Figure 39. Effect of DKP innovation design (DID) on ELA (after DKP innovation)

It is important to add that, this equation is valued for DID indices ranging between 2.55 (minimum value of DID) to 4.80 (maximum value of DID). The analysis shows that the estimated rate of change in ELAs (after DKP integration into FAP), for one index change in DID was 1.105 index. A 95% confidence interval for the true change is (0.974, 1.237).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMENDATIONS

5.1 Introduction

A summary of this study is provided in this section in addition to conclusion, recommendations for enhancing the FAP design attributes to improve the students experiential learning abilities (ELAs). The chapter ends by proposing possible concepts of the study that can be taken up for further studies.

5.2 Study Summary

Universities play a major role in forming professionals who can be entrusted with a wide range of development services in a country. However, the universities have been under pressure to produce graduates with adequate professional competences. These knowledge, skills and attitudes (competences) are best acquired from learning by 'reflection on doing" commonly known as experiential learning. The approach to learning involves provision of job shadowing opportunities to students to allow students to learn from their experiences. Farm Attachment Programme (FAP) of Egerton university, provides an EL opportunities where students acquire hands on experiences using experiential learning approach. However, experiential learning does not just happen but requires experiential learning abilities including; willingness to get actively involved in the learning experiences, ability to reflect on learnt experiences, ability to analyze learnt experiences, ability to solve problems and make decisions and finally, for the purpose of this study, ability to make continuity arrangements for initiated projects / innovations.

Despite efforts by Egerton University to encourage learning by experiential learning approach through FAP, experiential learning abilities have never been quantified for the purpose of improvement. In addition, the effects of FAP design attributes on student's practicum competences have never been assessed for enhancement. This study set out to i) characterize the design attributes of Farm Attachment Programme (FAP) of Egerton University to show areas of improvement, ii.) Assess how practicum student competencies (ELAs) are affected by FAP attributes in Egerton University, iii.) explore how DKP innovation design attributes integrated into FAP affect ELAs among practicum students in Egerton University and iv.) Determine the extent to which the DKP Innovation integrated into FAP improves ELA among Egerton University students.

This study adopted a Participatory Action Research (PAR) design. A systematic random sampling technique was used to select 102 students who had participated in FAP of Egerton University from 2016 to 2019. A baseline survey which entailed collecting data from online google groups (set up from 2015 to 2019), focus group discussions and a survey questionnaire, was conducted. The data gathered from the baseline survey was used to develop an intervention that would enhance the FAP design attributes and improve students' experiential learning abilities. From literature review and the baseline survey it was found that it was important to provide prior knowledge to students using experiential learning approach for internal guidance. Most of the knowledge was packaged in the DKP innovation under DKP resources.

A group of 30 innovative students were purposively selected to use the innovation during FAP from their third week of FAP in 2019. The innovation provided digitally packaged knowledge in the following areas of agriculture: livestock, crops, agribusiness/ agricultural economics and agricultural engineering knowledge areas in addition to video resources. There were inbuilt power point presentations known as DKP weekly structure to help the students organize their learning experiences every week. To help the students use the DKP, a training workshop was conducted for the students in their third week of FAP. Another DKP enablement attribute was the DKP hyperlinks which were set up to help the students navigate the digital content. Online google groups were also created to allow real time interaction of students with the researcher. The training workshop, the hyperlinks and the google groups were packaged as DKP implementation enablement (DIM) in the DKP innovation. A digital page known as students' portfolio was also created in the DKP to enable the students to reflect on learnt experiences. The portfolio allowed the students reflect on the farm enterprises available in their host farms from which they conducted job analysis and task analysis in addition to preparation of daily jobsheets.

A 5-point continuum scale was used to measure the indices of experiential learning abilities, DKP design attributes and levels in FAP attributes. SPSS version 21 was used to analyze both quantitative and qualitative data. Qualitative data were coded in major theme patterns and descriptive statistics run to summarize using measures of central tendencies and measures of variability. Boxplots, pie charts, bar charts scatter plots and line graphs were used to represent the data graphically. Inferential statistics including general linear models were used to

estimate the effects sizes using Partial Eta Squared. Multiple linear regression models were also used in predicting dependent variables from independent variables. The significance of the models was verified using Anova and t- tests at 5% levels of significance.

The study revealed that under the current structure and implementation of FAP, the students had low levels of experiential learning competences. The readiness to learn from the farm experience and write reflectively on what they had learned, capabilities to conduct analysis of learned experiences, capacity to solve problems so as to make informed decisions in addition to making continuity arrangements for initiated projects were not adequate. However, improvements of these abilities were achieved by designing and integrating a DKP innovation into FAP. Motivation to actively participate in the learning experiences was provided under the DKP weekly structure. At the beginning of every week there were power point presentations that guided the students on the activities for the week. This motivated the students and improved their willingness to participate in learning farm experiences. Implementation and reflection of learned experiences was enhanced through students' portfolios. Hyperlinks were embedded in the weekly power point presentation to make implementation of the DKP effective. Using the hyperlinks, the students were able to navigate through the digital content in the DKP with a lot of ease. The hyperlinks together with training workshops organized for the students improved the implementation aspects of the DKP. Lastly the DKP resources provided referencing materials in digital formats for use by students.

The Digital Knowledge Pack Innovation was found effective means of improving students experiential learning abilities. It helps to structure and implement FAP in a more organized way and provided required knowledge by the students. Using the DKP motivated the students to be more willing to participate in farm experiences, to reflect more on knowledge, skills and attitudes acquired. In addition, the DKP enhanced the ability of the students to analyze farm experiences and thus becoming more analytical. In this regard the students improved their abilities to solve problems and make appropriate and timely decisions. The evaluation week structured in the weekly structure enabled students to make continuity arrangements to projects/innovations initiated in the host farms. This ensured sustainability of those projects even long after the students left the host farms.

5.1 Conclusions

The following are conclusions drawn from this study as per the research questions:

i). The Overall student's practicum competencies (ELAs) are low among the students in the current structure and implementation of FAP and majority of the host farmers are engaged in dairy farming and maize production

ii). There are some FAP attributes that have significant effects on students ELAs namely: gender of the students, academic department at the university, prior knowledge levels in agriculture. In addition, the host farmer's level of income and FAP structure and implementation attributes were found to have significant effects on students' ELAs.

iii) The DKP innovation design characterized by four attributes namely; DKP weekly structure; DKP students' portfolio; DKP implementation enablement and DKP resources have significant effects on students' ELAs.

iv). The DKP Innovation integrated into FAP improves experiential learning abilities among Egerton university students to a significant effect.

5.2 Recommendations

Following are the recommendations made from this study

i. Egerton University to continue enhancing FAP attributes including students' attributes, host farmer attributes and FAP structure and implementation attributes for continued improvement of students' ELAs.

ii. Egerton university to ensure that FAP activities are well coordinated at the departmental level because this coordination affects students' ELAs. At the same time university to offer support to students hosted by low-income farmers to avoid the negative effects the attribute has on students ELAs.

iii. Egerton university to adopt DKP innovation and to continually monitor and evaluate its use by the students during FAP. There is strong evidence from this research that the DKP if used, can improve students' levels of ELAs.

iv. Use of the DKP innovation should be upscaled for commercialization among students in universities and other institutions of higher learning who undertake field attachment programmes and other practicum activities including teaching practice.

5.3 Recommendations For Further Research

Following the recommendations suggested in this study, the following proposals were made for further research:

i. Research should be conducted to establish the effects of university supervision on students on Experiential learning abilities

ii. Further research should be conducted to find out why different students' cohorts posted varying levels of experiential learning abilities.

iii. To find out why students hosted by low- income farmers posted lower experiential learning ability levels

iv. To improve on the design of the DKP, further research should be conducted to establish other gaps that may exist in FAP and address those challenges by innovating around the DKP design

v. Further research should be done to design a DKP whose attributes do not have multicollinearity challenges so as to allow for analysis of individual contribution of the effects of DKP design attributes on experiential learning ability

vi. Further research should be conducted to find out how the DKP innovation can be upscaled and commercialized among university students undertaking field attachment and other practicum activities including teaching practice.

vii. Researchers should create methodologies that can be used in digital innovations which are not affected by multicollinearity of independent variables. This will allow independent measurement of the innovation attributes and study the variables more effectively.

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APPENDICES

Appendix A: Online google group observation proforma

The online google group observation proforma is designed to help the researcher gather information on students' knowledge gaps from the online google groups created for the students between 2015 to 2019

Online Google Group	Questions from students	Knowledge construct	Knowledge major area
Shamba juu google group	1		
	2		
	3		
	4		
Farm up internship group	1		
	2		
	3		
	4		
Farm Target Israel	1		
	2		
	3		
	4		
DKP google group	1		
	2		
	3		
	4		

Appendix B: Focus Group Discussion Topic Guide

Introductions

Thank you for your willingness to actively participate in this focus group discussion. Your contribution is highly appreciated.

Purpose of Focus Groups

My name is Nancy and I am conducting this focus group to collect data for my PhD research. The reason we are having the focus groups is to get an in-depth understanding of the kind of knowledge you may require during your FAP and probably see how this knowledge can be availed to you during farm attachment. It will also help Egerton University to see FAP areas of improvement in future.

We need your input and would like to urge you to share your honest and open thoughts with us.

Location	*Hanaan Guest House*	
Date	*Gender*	*Number*
Gender	*Females 3*	*Males 7*
Moderator	*N chege*	
Note taker	*Kelvin Kamau*	

Ground Rules

1. You will do the talking; we will do the listening.

- *We would like everyone to participate.*
- *We may call on you if we have not heard from you in a while.*

2. There are no right or wrong answers.

- *All person's experiences and opinions are important.*
- *Speak up whether you agree or disagree.*
- *We want to hear a wide range of opinions.*

3. What is said in this room stays here.

- *We want folks to feel comfortable sharing when sensitive issues come up.*

4. We shall record the proceedings of the group.

- *We want to capture everything you have to say.*
- *We will not identify anyone by name in our report. You will remain anonymous.*

Insert Ice breaker here (to increase comfort and level playing field)

Overview of the Farm Attachment Programme (FAP)

Question 1:

How is FAP organized? (Capture the power structures; decision-making process; conflict resolution; important occasions; roles by gender) [Probe on the role of students]

Question 2:

What are your host farmers' main economic activities in this c? {Indicate the relative importance of the activities; who engages in each enterprise (livestock kept, crops grown, business); reasons for choice of specific activities to engage in;

any emerging enterprises and the drivers}

Question 3: open forum

Kindly share your experiences in your host farm for the past three weeks since you reported

a) What are the main challenges you have noted so far?

b) What knowledge do you think you require to enhance you experiential learning abilities?

Question 4

(a) What are the main knowledge challenges during FAP?

(b) How are you coping with the challenges?

Question 5

What is your level of willingness to participate in the farm experiences? Probe

Question 6

Do you reflect on what you have learnt in the course of the day? Do you document what you have learnt? Where do you record?

Question 7

What kind of analysis do you carry out in the farm? Do you need software to assist in carrying out analysis?

Question 8

How often do you help solve farm problems? Do you make decisions?

Question 9

What continuity arrangements do you intend to make for the projects you have imitated in the host farm?

THANK YOU

Appendix C: Baseline Questionnaire

Nancy Chege.

Egerton University,

Department of Agricultural Education,

and Extension Box 536,

Njoro.

Dear Student,

Re: Questionnaire Administration

I am a post-graduate student in Egerton University Department of Agricultural Education and Extension in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in Agriculture and Rural Innovation Studies**.** I am carrying out research on effectiveness of digital knowledge pack innovation in enhancing experiential learning among Egerton University students on farm attachment.

Please read the instructions carefully and provide answers to the items in the questionnaire attached to this letter. All information you give will be treated with confidence.

Thanks in advance

Yours sincerely,

Nancy Chege

students questionnaire KNOWLEDGE GAPS AND EXPERIENTIAL LEARNING ABILITIES

Section A: Background information

Gender

Choose

Degree programme

Your answer

Faculty

Your answer

Department

Your answer

Reg. number

Your answer

students home county

Your answer

year of attachment

Your answer

Month of attachment

Date

mm/dd/yyyy

sub-county ward of host farmer

Your answer

host farm county

Your answer

Age of the host farmer

- Below 20years
- 21-30 yrs
- 31-40yrs
- 41-50 yrs
- 51-60 yrs
- 61 and above years

Type of host farmer

- small scale farmer
- Large scale farmer

check the boxes indicating the type of enterprises in your host farms

	Column 1
Dairy farming	○
poultry farming	○
sheep and goats farming	○
maize farming	○
cabbage farming	○
Beans farming	○
others (specify)	○

Type of host farmer

- ○ small scale farmer
- ○ Large scale farmer
- ○ Other: _____

farmer's level of education

Choose ▾

Farmers socio- economic status

Choose ▾

check the boxes indicating the type of enterprises in your host farms

Types of pigs in your host farm

- ○ large white
- ○ landrace
- ○ indigenous
- ○ Other: _____

check boxes showing types of dairy breeds in your host farms

- ☐ fresians
- ☐ Guernsey
- ☐ ayrshire
- ☐ jersey
- ☐ crossbreeds
- ☐ Other: _____

Types of poultry in your host farm

- ☐ Layers
- ☐ broilers
- ☐ indigenous breeds
- ☐ Other: _____

Rate your level of competence in the following bodies of knowledge that maybe necessary during your farm attachment

	1. very poor	2.Poor	3. fair	4. Good	5. excellent
Knowledge on identifications of crop pests	○	○	○	○	○
knowledge on control of crop pests	○	○	○	○	○
Knowledge on registered pest control products	○	○	○	○	○
knowledge on diagnosis of livestock diseases	○	○	○	○	○
knowledge on dairy nutrition and animal feeds	○	○	○	○	○
knowledge on zero grazing	○	○	○	○	○

knowledge on zero grazing management	○	○	○	○	○
knowledge on weeds and control	○	○	○	○	○
knowledge on soil sampling and analysis	○	○	○	○	○
Knowledge on vegetable growing	○	○	○	○	○
knowledge on field crops management	○	○	○	○	○
knowledge in farm records and accounting	○	○	○	○	○
knowledge on farm management	○	○	○	○	○
knowledge on marketing of farm products	○	○	○	○	○

knowledge in farm tools and equipment	○	○	○	○	○
knowledge in farm structures	○	○	○	○	○
knowledge in plant breeding	○	○	○	○	○
knowledge in pig farming	○	○	○	○	○
knowledge in fish farming	○	○	○	○	○
knowledge in poultry farming	○	○	○	○	○
poultry farming	○	○	○	○	○
Dairy farming	○	○	○	○	○

what challenges do you encounter in search of the knowledge to solve farm problems?

Your answer

give suggestions of how the issue of source of knowledge during attachment can be addressed

Your answer

How good are you at :

	1	2	3	4	5
getting involved in digging , milking and all farm experiences	☐	☐	☐	☐	☐
documenting the learnt experiences on a daily basis?	☐	☐	☐	☐	☐

keeping farm records ?	☐	☐	☐	☐	☐
identifying farm problems eg diseases affecting crops or constructing a farm structure to house animals??	☐	☐	☐	☐	☐
making farm decisions eg when to carry out various field practices?	☐	☐	☐	☐	☐
planning the jobs to be done during attachment?	☐	☐	☐	☐	☐
Job analysis?	☐	☐	☐	☐	☐
Task analysis?	☐	☐	☐	☐	☐
preparation of job sheets to guide you on	☐	☐	☐	☐	☐

carrying out evaluations on learnt experiences?	☐	☐	☐	☐	☐
designing a questionnaire to collect data ?	☐	☐	☐	☐	☐
designing a tool to use for evaluation of learnt experiences	☐	☐	☐	☐	☐
analyzing farm data?	☐	☐	☐	☐	☐
making continuity arrangements for initiated innovations 15	☐	☐	☐	☐	☐

How effective is the structure and implementation of FAP in;

	1	2	3	4	5
identification of host farm enterprises before attaching students	☐	☐	☐	☐	☐
preparation of students on how to plan for 8 weeks attachment	☐	☐	☐	☐	☐
preparation of students identification of jobs from farm enterprises	☐	☐	☐	☐	☐
preparation of students in conducting farm jobsanalysis	☐	☐	☐	☐	☐

preparation of students in conducting farm tasks analysis	☐	☐	☐	☐	☐
preparation of students on writing daily job sheets	☐	☐	☐	☐	☐
matching of students and host farms	☐	☐	☐	☐	☐
preparation on field attachment report writing	☐	☐	☐	☐	☐
preparation on how to do reflections after each days learning experiences	☐	☐	☐	☐	☐
preparation of how to collect farm data and analyse it	☐	☐	☐	☐	☐

preparation on how to do reflections after each days learning experiences	☐	☐	☐	☐	☐
preparation of how to collect farm data and analyse it	☐	☐	☐	☐	☐
preparation on how to solve problems and make decisions	☐	☐	☐	☐	☐
preparation on making continuity arrangements for initiated innovations on	☐	☐	☐	☐	☐
briefing the host farmer on kind of jobs a student should do.	☐	☐	☐	☐	☐
deciding who should plan	☐	☐	☐	☐	☐

indicate your score of competence in the following experiential learning abilities, 1-very poor 2-poor, 3-fair, 4-Good, 5-excellent

	1	2	3	4	5
Experiential Learning Abilities	☐	☐	☐	☐	☐
ability to willingly get actively involved in farm experiences	☐	☐	☐	☐	☐
ability to willingly work with other in a team	☐	☐	☐	☐	☐
ability willingly to observe punctuality	☐	☐	☐	☐	☐
ability to willingly obey instructions from managers or host farmers	☐	☐	☐	☐	☐
Ability to reflect on learnt experiences	☐	☐	☐	☐	☐
ability to reflect and record what was	☐	☐	☐	☐	☐

Was the induction workshop useful in preparing you for farm attachment?

Choose

if yes, give reasons

Your answer

if no, give reasons

Your answer

what are the major challenges of the FAP programme?

Your answer

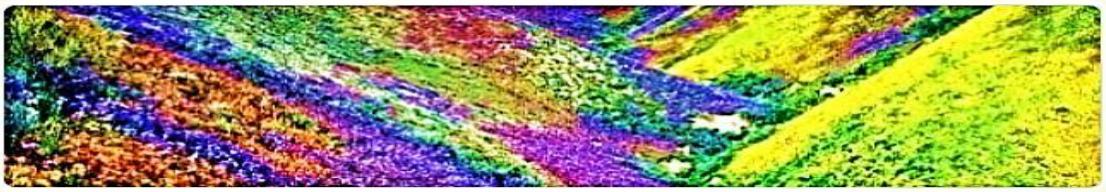
ability to reflect and record what was learnt on a daily basis	☐	☐	☐	☐	☐
ability to reflect and start compiling the field attachment report	☐	☐	☐	☐	☐
Ability to reflect and conduct farm job analysis	☐	☐	☐	☐	☐
Ability to reflect and conduct task analysis	☐	☐	☐	☐	☐
ability to reflect and prepare daily job sheets	☐	☐	☐	☐	☐
ability to reflect and conduct evaluations of learnt expereinces	☐	☐	☐	☐	☐
Ability to analyze farm expereinces	☐	☐	☐	☐	☐
ability to analyze data in farm records	☐	☐	☐	☐	☐

ability to identify problems in the farmeg diseases and pest	☐	☐	☐	☐	☐
ability to solve problems e.g. suggest remedy for diseases and pests	☐	☐	☐	☐	☐
ability to make decisions e.g. what to do on daily basis	☐	☐	☐	☐	☐
ability to initiate new projects/innovations	☐	☐	☐	☐	☐
Ability to continue wiyh previously initiated innovations/projects by previousy attached students	☐	☐	☐	☐	☐
ability to make continuity arrangements for initiated projects	☐	☐	☐	☐	☐

The End: Thank you so much and God bless you

Description (optional)

Appendix D: DKP Evaluation Questionnaire



DIGITAL KNOWLEDGE PACK evaluation Questionnaire

Digital Pack Evaluation Questionnaire

Gender

- ○ Male
- ○ Female
- ○ Other: _____

Degree programme

Your answer

Department

Your answer

Faculty

Your answer

Which device did you use to access the DKP folder

- ○ Laptop
- ○ desktop
- ○ smart phone

a. DKP Weekly Structure

In a scale of 1-5, rate the following in relation to the weekly structures of farm attachment activities as structured in the DKP 1-very poor, 2=poor, 3=fair, 4=good and 5=excellent

Indicate your Rating

	1	2	3	4	5
The power point slides presented in the DKP at the beginning of every week of FAP, improved my willingness to be more actively involved in the farm experiences	☐	☐	☐	☐	☐
The power point slides presented in the DKP at the beginning of every week of FAP, improved my ability to reflect on my learning experiences	☐	☐	☐	☐	☐
The power point slides presented in the DKP at the beginning of every week of FAP, improved my ability to analyze farm experiences	☐	☐	☐	☐	☐
The power point slides presented in the DKP at the beginning of every week of FAP, improved my ability to solve more problems and make better decisions	☐	☐	☐	☐	☐
The weekly power point slides presented in the DKP at the beginning of every week of FAP improved my ability to make continuity arrangements for initiated innovations/projects	☐	☐	☐	☐	☐

innovations/projects					
The power point presentations in the DKP at the beginning of each week improved my ability to navigate the DKP and access the student's portfolios	☐	☐	☐	☐	☐
The power point presentations in the DKP at the beginning of each week improved my ability to navigate and access the DKP resources	☐	☐	☐	☐	☐
The links in the power point presentation made it easy for me to navigate the DKP thus enhancing my experiential learning abilities	☐	☐	☐	☐	☐
The DKP weekly structure improved my experiential learning abilities	☐	☐	☐	☐	☐

learning abilities					
The DKP improved my willingness to be actively involved in farm experiencesRow 10	☐	☐	☐	☐	☐
The DKP improved my ability to reflect on learnt experiences	☐	☐	☐	☐	☐
The DKP improved my ability to solve problems	☐	☐	☐	☐	☐
The DKP improved my ability to make decisions	☐	☐	☐	☐	☐
The DKP improved my ability to make continuity arrangements for initiated innovations/projectsw	☐	☐	☐	☐	☐

decisions					
The DKP improved my ability to make continuity arrangements for initiated innovations/projectsw 14	☐	☐	☐	☐	☐

In your opinion, what more can be included In the design of the DKP weekly structure to enhance experiential learning abilities among the students on farm attachment

b. DKP Students Portifolio

In a scale of 1-5, rate your experiential ability levels as a result of using DKP during farm Attachment where 1=very poor, 2=poor, 3=fair, 4=good and 5=excellent

	1	2	3	4	5	Column 6
Taking a farm tour, identifying the farm enterprises and recording in my student portfolio improved my willingness to be actively involved in the farm experiences	☐	☐	☐	☐	☐	☐
Carrying out job analysis in the students' portfolio improved my willingness to be actively involved in the farm	☐	☐	☐	☐	☐	☐

experiences						
Carrying out task analysis in the students portfolio improved my willingness to be actively involved in the farm experiences	☐	☐	☐	☐	☐	☐
Preparing job breakdown sheets in the students portfolio, to guide me on daily job operations improved my willingness to be actively involved in the farm experiences	☐	☐	☐	☐	☐	☐
Analyzing farm enterprises in the students portfolio improved my ability to reflect on what I learnt from farm experiences	☐	☐	☐	☐	☐	☐
Carrying out job						

Carrying out job analysis improved my ability to reflect on what I learnt from farm experiences	☐	☐	☐	☐	☐	☐
Carrying out task analysis improved my ability to reflect on what I learnt from farm experiencesow 7	☐	☐	☐	☐	☐	☐
Preparing job breakdown sheets to guide me on daily job operations improved my ability to get more involved in the farm experiences	☐	☐	☐	☐	☐	☐
Marking of the job breakdown sheets and getting feedback from the researcher improved my experiential learning abilities	☐	☐	☐	☐	☐	☐

learning abilities						
Analyzing farm enterprises improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐
Carrying out job analysis improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐
Carrying out task analysis improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐	☐
Preparing job breakdown sheets to guide me on daily job operations improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐
Analysis of enterprises in the						

Analyzing farm enterprises improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐
Carrying out job analysis improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐
Carrying out task analysis improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐	☐
Preparing job breakdown sheets to guide me on daily job operations improved my ability to solve farm problems and make decisions	☐	☐	☐	☐	☐	☐

improved my ability to solve farm problems and make decisions						
Analysis of enterprises in the farm improved my ability to make continuity arrangements for innovations/projects initiated in the farm	☐	☐	☐	☐	☐	☐
Carrying out job analysis improved my ability to make continuity arrangements for innovations/projects initiated in the farmow 15	☐	☐	☐	☐	☐	☐
Carrying out task analysis improved my ability to make continuity arrangements for innovations/projects initiated in the farmRow 16	☐	☐	☐	☐	☐	☐

Preparing job breakdown sheets to guide me on daily job improved my ability to make continuity arrangements for innovations/projects initiated in the farm	☐	☐	☐	☐	☐	☐
DKP students portfolio enhanced my experiential learning abilities	☐	☐	☐	☐	☐	☐
DKP students portfolio enhanced my ability to make continuity arrangements for innovations/projects initiated in the host farm	☐	☐	☐	☐	☐	☐

c. DKP Resources

In a scale of 1-5, rate the following in relation to DKP resources where 1=very poor, 2=Poor, 3=fair, 4=Good and 5= Excellent

	1	2	3	4	5
Availability of resources on disease and pest identification in the DKP, improved my willingness to be actively involved in the farm experiences	☐	☐	☐	☐	☐
Availability of resources on registered products					
Availability of resources on registered products recommended for control of pests and diseases in the DKP, improved my ability to reflect on my learning experiences	☐	☐	☐	☐	☐
Availability of Agribusiness resources in the DKP, improved my ability to reflect on my learning experiences	☐	☐	☐	☐	☐
Availability of crops production resources in the DKP, improved my ability to reflect on my learning	☐	☐	☐	☐	☐

reflect on my learning experiences					
Availability of livestock production resources in the DKP improved my ability to reflect on my learning experiences	☐	☐	☐	☐	☐
Availability of resources on disease and pest identification in the DKP, improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐
Availability of resources on registered products recommended for control of					

for control of pests and diseases in the DKP, improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐
Availability of Agribusiness resources in the DKP, improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐
Availability of crops production resources in the DKP, improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐
Availability of livestock production resources in the					

production resources in the DKP improved my ability to solve problems and make decisions	☐	☐	☐	☐	☐
Availability of video resources in the DKP, improved my experiential learning abilities	☐	☐	☐	☐	☐
Row 17	☐	☐	☐	☐	☐

.18 In your opinion, what more can be included in designing DKP resources to enhance students' experiential learning abilities

Your answer

_19. b. How effective was the DKP in enhancing your experiential learning?

- ◯ 1. Not effective
- ◯ Effective
- ◯ Very effective

In your opinion what factors affected the effectiveness of the DKP?

Your answer

20a. did you experience any challenges when using the DKP?

Choose

What are some of the challenges?

_19. b. How effective was the DKP in enhancing your experiential learning?

- 1. Not effective
- Effective
- Very effective

In your opinion what factors affected the effectiveness of the DKP?

Your answer

20a. did you experience any challenges when using the DKP?

Choose

What are some of the challenges?

Your answer

How useful was the seminar organized at Hanaan guest house in demonstrating how to use knowledge in the DKP?

Choose

THE END: THANKS

Date

mm/dd/yyyy

Appendix E: Samples of Student's Job Analysis Sheet

Dear student,

Thank you for the good progress you have made in your attachment program. We are still planning on the jobs you will engage in for effective learning. YOUR activity here is to do some job analysis i.e. identifying tasks that are necessary to accomplish the jobs you have identified from the farm enterprises present in your host farm. See my example of job analysis in the farm attachment folder known as job and task analysis. Proceed and carry out your own analysis and enjoy learning. Write your jobs and tasks in the spaces below

JOB ANALYSIS WORKSHEETS

JOBS		TASKS
JOB A: _____	A1.1	_____
	A1.2	_____
	A1.3	_____
JOB B: _____	B1.1	_____
	B1.2	_____
	B1.3	_____
JOB C: _____	C1.1	_____
	C1.2	_____

TASK ANALYSIS WORKSHEETS

Dear student,

Welcome to the next activity in our attachment program, ie carrying out an activity known as task analysis, derived from your job analysis

Characteristics of tasks

Tasks may be manipulative (Skills, psychomotor), informational (Knowledge, cognitive) or attitudinal (attitudes, affective)

Task analysis entails classifying the task from job analysis activity into three domains of learning. See my example in the folder labelled "TASK ANALYSIS"

Task	Knowledge	Skills	Attitudes
A1.1			
A1.2			
A1.3			

Appendix F: Task Analysis Worksheet

Appendix G: Farm Attachment Jobsheet

FARM ATTACHMENT JOB SHEET		
Name of Farm	*ROHO SAFI FARM*	
Student's Reg No.	*K11/13715/16*	
Job operation	*Plucking and sun drying of pyrethrum*	
Materials and Equipment	*Gunny bags, sickles*	
What?	**How?**	**Why?**
Important steps	**Key points**	**Reason**
Logical segment of the operation	Anything in the step that might make or break the job	Reasons for key points
1. Assemble the gunny bags	*Make sure they have perforations*	*For efficient air circulation*
2.Inspect the pyrethrum field	*To ensure right stage of harvest*	*To harvest at optimum pyrethrin content*
3.Plucking	*Ensure to pluck flowers with 2-3 florets open*	*To ensure the flowers have maximum pyrethrin content*
Place the plucked flowers on perforated gunny bags Spread the flowers on polyethene's for sun drying	*Ensure flowers are harvested when there is no dew in the morning Ensure the flowers turn color from white petals and yellow disc florets to brown*	*To reduce fermentation Drying reduces the moisture levels for easy processing*
REFLECTION		
What went on well with the job operation?		
The operation went on as planned		
What did not go on so well?		
The flower yield was low because most of the bolls were affected by the bud disease		
What can be done differently to make the operation better in future?		
Spraying with the correct pesticides to control thrips that are vectors of the bud Disease		
References		
Text book: Auckland, Tropical crops of East Africa, DKP video, DKP resources-> Crops->Pyrethrum-> harvesting DKP resources,		

Appendix H: Research License

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 820560

Date of Issue: 06/July/2020

RESEARCH LICENSE

This is to Certify that Ms.. NANCY WAITHERERO CHEGE of Egerton University, has been licensed to conduct research in Nakuru on the topic: EFFECTIVENESS OF DIGITAL KNOWLEDGE PACK INNOVATION IN ENHANCING EXPERIENTIAL LEARNING AMONG EGERTON UNIVERSITY STUDENTS ON FARM ATTACHMENT for the period ending : 06/July/2021.

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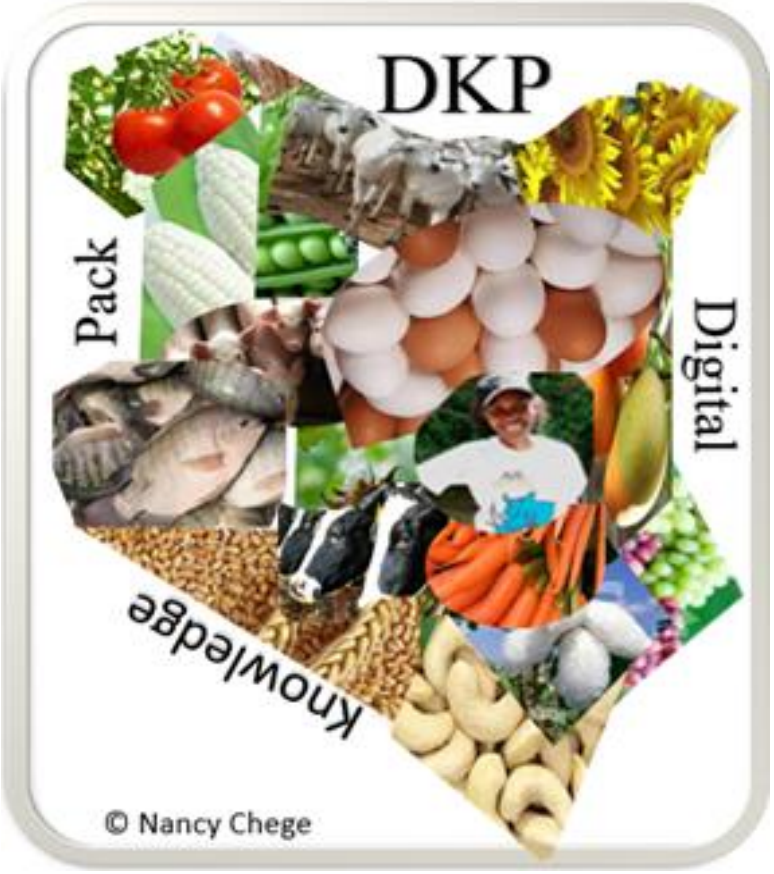
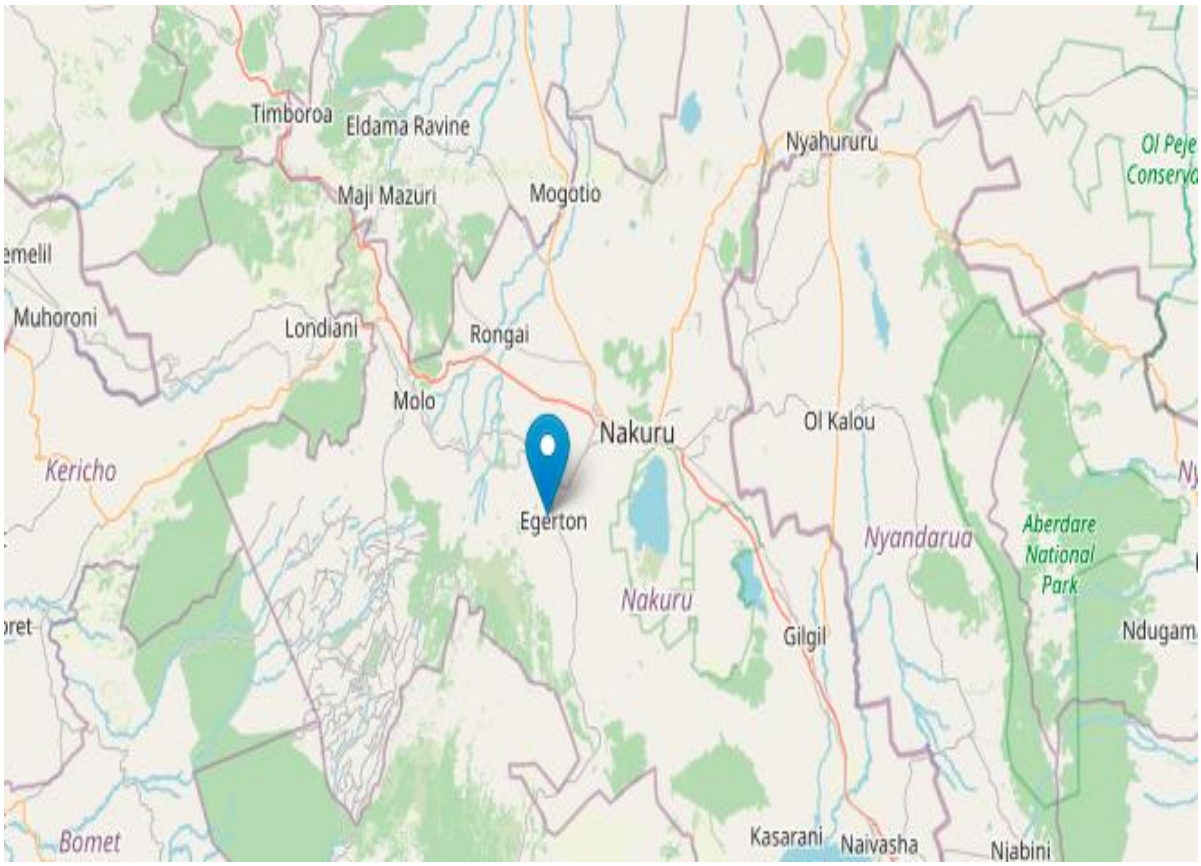
Appendix I: The Farm Attachment programme

DKP

Logo



Appendix J: Map showing location of Egerton University



Appendix K. Abstracts for Publications and Thesis

a. The Effect of Farm Attachment Programme (FAP) Design Attributes on Experiential Learning Ability among Egerton University Students

Nancy W. Chege1*, Justus M. Ombati2 and Nancy W. Mungai3

Article Information

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Original Research Article

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ABSTRACT

The Farm attachment programme (FAP) of Egerton University was established six years ago to promote learning by "reflection on doing" commonly known as Experiential Learning (EL), among students. However, effectiveness of experiential learning is dependent on possession of certain abilities known as experiential learning abilities (ELAs) including willingness to get actively involved in learning experiences and ability to reflect, analyze, solve problems and make decisions on learnt experiences. Egerton University students' ELAs and FAP design attributes have never been assessed for the purpose of enhancing experiential learning. This study aimed at determining levels ELAs among the students and assessing the effects of FAP design attributes on these abilities. The study adopted a cross sectional survey design targeting a population of 600 students and their host farmers. Systematic random sampling procedure was employed to select 102 students to participate in the survey. A 5-point continuum scale was used to rate gathered indicators to measure ELAs. Descriptive and inferential statistics were used to analyze the data. Students ELA Levels were found to be low (M= *2.79, SD = 0.51*). The following FAP design attributes were found to have a significant effect on ELAs: Students' prior agricultural knowledge levels (F *(2.94) = 3.816*), *P* =0.02) with an effect size of 8%, gender (F *(1,96) = 4.312, P = .037*), with an effect size of 4.4% Students study programme departments, (F *(6,91) =2.652, =.011)*, with an effect size of 16.4%, Year of attachment *(F (3,94) =4.206, P= .008)*, with an effect size of 11.8%. Among the host farmer attributes, income level of the farmer was found to have a significant effect on students' ELAs *(F (2, 94) =3.920, p=.026). FAP* structure and implementation had significant effects on experiential learning ability (F (2,94) =4.309) *P= .016; F (2,94) =8.51, P <.001) and* effect sizes of 8.4% and 13.9% respectively. The results showed that the ELA levels were low among students and certain FAP design attributes had a significant (at 5% level of significance) effect on the learning abilities.

Keywords: Egerton University; farm attachment programme; experiential learning ability; students; host farmers.

Appendix L: Journal Publications

B. Evaluating the Effectiveness of a Digital Knowledge Pack in improving Agricultural Experiential Learning: The Case Study of Egerton University's Students, Kenya Nancy W. Chege a*, Nancy W. Mungai b and Justus Ombati

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Evaluating the Effectiveness of a Digital Knowledge Pack in improving Agricultural Experiential Learning: The Case Study of Egerton University's Students, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. Author NWC designed the study, performed the analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NWM and JO reviewed and approved the design of the study, analysis, protocols and the manuscript. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

One of the roles of higher education is to produce competent professionals with high employability skills. Learning by doing commonly known as Experiential Learning (EL), is an approach to learning that helps students acquire competences needed in the job markets. Field attachment including Farm Attachment Programme (FAP) of Egerton University (EU) is known to provide opportunities for EL. However, the effectiveness of this approach to learning is dependent on possession of prior knowledge and EL abilities including ability to; willingly get actively involved in the learning experiences, reflect, analyze, solve problems, make decisions in addition making continuity arrangements for innovations/projects initiated. This study aimed at evaluating the effectiveness of a designed Digital Knowledge Pack (DKP) to improve the levels of ELAs among the students of EU. The DKP design attributes under evaluation were the DKP; weekly structure, implementation enablement, students' portfolio and resources. The specific objectives of the study were to(i) characterize EU students on FAP (ii) determine the levels obtained on ELAs with each DKP

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ABSTRACT

Globally universities are under pressure to produce competent professionals. Experiential Learning (EL) approach has demonstrated the potential to contribute to development of such capabilities. However, EL does not just happen; it requires high prior knowledge in the technical area and students' possession of Experiential Learning Abilities (ELAs) to enhance learning from experiences. Despite Egerton University's (EU) efforts to provide EL through its Farm Attachment Programme (FAP), students' ELAs have never been quantified for the purpose of improvement. This study aimed at integrating a Digital Knowledge Pack Innovation (DKP) into field Attachment and evaluating its effects on students experiential learning. The innovation was characterized by: DKP weekly structure (DWS), DKP students' portfolio (DSP), DKP implementation enablement (DIM) and DKP Resources (DR). Participatory Action Research design targeting six hundred students and their host farmers was employed. Systematic random sampling technique was used to select 102 students for the baseline survey (2016, 2017 and 2018 cohorts). Piloting was conducted among ten (10) students in Rongai ward and a Cronbach's alpha reliability coefficient of r = .80 obtained. Thirty (30) students (2019 cohort) participated in the action phase conducted in Njoro ward of Nakuru county. The students were allowed to proceed for FAP in the first three weeks and DKP innovation introduced in the fourth week of FAP. Google group observation proforma, focus group discussion topic guide, semi structured baseline questionnaire and DKP evaluation questionnaires, validated by Experts from Egerton University were used for data collection. The study revealed that FAP was characterized by: students', host farmers' and FAP structure and implementation attributes. In addition, the ELA levels were low (M=2.79, SD=0.51). Students' Prior knowledge in agriculture, students' gender, students' academic departments, host farmer's level of income and FAP structure and implementation attributes were found to affect ELAs. Further, the DKP innovation enhanced FAP resulting in high (M=4.04, SD = 0.68) ELAs. A Multiple Linear Regression (MLR) was run which also included Variance Inflation Factor (VIF) in the output. Multicollinearity of some DKP innovation attributes was found. A Principal Component Analysis (PCA) was run in SPSS to resolve the issue and one component [DKP Innovation Design (DID) attribute] solution found. Integrating DKP into FAP improved ELA index by 1.356 at 95% confidence level [1.005, 1.706; t (29) = -7.900, $p \leq .0001$)]. GLR model predicting ELAs ($_{\text{after DKP}}$) from DID attribute, was highly significant [F (4,25) =69.261), p = .0001)]. In conclusion, the study showed that there is need for universities and other tertiary institutions to improve students' practicum competences by integrating DKP innovation into their field attachment programmes (including FAP), practicums and internships.