

# Project Based Training as a Strategy for Equipping Z-Generation Work Force with Transferable Agricultural Competencies

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## Abstract

The Z-generation is being trained at a time when the world is undergoing global challenges in agriculture. These challenges call for global concerted solutions where education takes the center stage. Thus, pedagogical approaches to equip trainees with problem-solving competencies cannot be undoubtedly estimated within the educational sphere. Project Based Learning (PBL) has been found to equip trainees with 21<sup>st</sup> century skills for problem solving. The paper documents the findings from a tracer study conducted in 87 secondary schools across Egerton three Teaching Practice zones, spanning a period of 10 years. Evidently, the findings reveal onsite success cases of PBL by Agricultural Education and Extension (AGED) undergraduate students where a total number of 125 Agriculture Teaching Practice Projects (ATPPs) were traced with 36 % of them being still in existence. Of these, livestock production emerged as the most common type of project with 34.5% while farm structures accounted for 19.6% of all the projects that were still in existence. Over time, most of the livestock production structures done as ATPPs had either been transformed into other structures or demolished due to competition for space. Transferability was measured on three fronts namely the application of Project Based Training (PBT) after graduation, use of the ATPPs in teaching other subjects and application of the PBT in establishing teaching learning projects by the AGED graduates in their stations. From the findings, it was concluded that less than half of the ATPPs established were still in existence and in use by over 87% of the teachers. Transferability of PBT existed either in teaching other subjects, establishing new agriculture teaching projects in schools or teaching agriculture subject. The study recommends that training institutions need to deliberately repump the PBT for acquisition of transferable skills necessary in solving global challenges.

**Key Words:** Agricultural Teaching Practice Projects, Global challenges, Problem solving, Project Based Training, Zoomers generation.

## Introduction

The second Sustainable Development Goal (SDG) by the United Nations is on Zero hunger geared towards ending hunger, achieve food security, improved nutrition and promote sustainable agriculture (United Nations, 2017). Agriculture being the economic mainstay of the country (Kathula, 2023). Agriculture's vibrant future is vested on the hands of the youth, the Z-generation (Widagda et al., 2022). The z-generation comprises 26% of the total population in the globe with over two Billion people. This population is more than one quarter of the entire world population and their potential to influence the economic sphere of the nation's cannot be downplayed. This is a youthful generation that is digitally native and has all its activities and investment in the digital space (Mathur & Hameed, 2016). However, agricultural production to address food security issues

may not necessarily be done in that digital space. Therefore, training this generation in readiness to this gigantic task is inevitable. Equipping the Z-generation with the 21<sup>st</sup> century competencies to solve global challenges that need globally concerted efforts in manifest (González-salamanca et al., 2020; (Mawonde & Togo, 2019)

Pedagogical approaches to train this generation on agricultural competencies for posterity come in handy. Participatory training of the 21<sup>st</sup> century youth require properly thought-out learning experiences, resources and appropriate pedagogy (Macarthur, Catherine T, 2021). Among the transformative pedagogical approaches are problem-based learning, simulated classrooms, cooperative learning, experiential learning and project-based learning (Mawonde & Togo, 2019). Although some of these methods have been in existence for a long time, repackaging the approach and trainers' zeal to embrace hands on experiences in training of agriculture cannot be overemphasized. According to (Gallagher & Savage, 2023) Project-Based Training (PBT) also referred to as Challenge-Based Training gives the trainees an opportunity to practice, be innovative, promotes critical thinking and implementation of their new ideas and technological advancements. Through projects, trainees in agriculture are able to try new innovations, expand existing projects, tailor projects that are entrepreneurial oriented and through technology; projects that embrace technology in Artificial Intelligence (AI), mechanization, value addition as well as marketing.

## **The Objectives of the Study**

The study aimed at tracing the success of Project Based Training as a strategy for preparing the Zenenial/Zoomer generation for the agricultural world of work.

### **Research Questions**

- i. What types of agriculture projects that existed in schools initiated by AGED teacher trainees from Egerton University?
- ii. What is the utility of the ATPPs established by AGED teacher trainees from Egerton University in the host schools?

### **Scope of the Study**

This study focused on the teachers of agriculture in the schools where student teachers of Agricultural education did teaching practice between 2011 and 2020, from three selected teaching Practice Zones. It also focused on ATPPs in existence and established by AGED students on teaching practice.

## **METHODOLOGY**

### **Sampling Procedure and Sample Size**

A total of 432 Egerton University AGED graduates between 2011 and 2020 were traced through snowball sampling. From this number across the ten teaching practice zones, a minimum sample of 125 projects was targeted from the three zones that recorded the highest responses in the baseline survey. Onsite visits captured 134 projects and after data cleaning a total of 127 ATPPs were used to present the findings. The three TP zones visited were Kericho-Bomet Kisii, Eldoret-Kitale and

Kisumu-Siaya –Busia-Kakamega. Across the visited schools, a total of 64 teacher of agriculture who are Alumni of Egerton were interviewed on usability of the ATPs.

### **Data collection Methods**

A checklist was used to trace the quality of the existing ATPPs while an interview schedule was used to establish the usability of the existing projects in the host stations. These instruments were developed by the researchers. The structured instruments contained both open ended and closed ended items. They were developed based on the objectives of the study. The questionnaire had two sections with section A sought the respondents’ demographic data and section B sought to determine the ways of utilizing the teaching practice projects established by AGED students in their TP schools.

### **Data Analysis**

Data obtained were cleaned, checked for accuracy and completeness, and thereafter, analyzed. Descriptive statistics were generated as per the objectives of the survey. The findings were presented in figures (graphs and charts) and tables. Additionally, qualitative data was summarized and described using frequencies and percentages.

## **RESULTS**

### **Existence of ATPPS in Host Schools**

Determination of whether the ATPPS were actually in existence or not was core in this study. Table 1 indicates a summary of the ATPPs established by AGED graduates during the study period. A total of 125 ATPPs were accessed and subjected to a checklist with a view to determining their status and use. The projects traced were categorized according to type and the distribution is as presented in Table 1.

**Table 1**

*Breakdown of Projects type per type*

<b>Project Type</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Livestock production	37	29.14
Farm structures	33	25.99
Crop production	19	14.95
Other	12	9.45
Weed and Weed control	12	9.45
Soil and water conservation	7	5.51
Fish farming	3	2.36
Agricultural Economics	1	0.79
Agroforestry	1	0.79
Apiculture	1	0.79
Factors influence agriculture	1	0.79
<b>Grand Total</b>	<b>127</b>	<b>100</b>

The findings from phase this phase were congruent with those of phase one where majority of the projects traced in schools were related to livestock production and farm structures at 29% and 26% respectively. Other areas where students on TP established projects in larger numbers were: crop production, weed and weed control and soil and water conservation at 15%, 9% and 5% respectively.

Out of the 127 ATPPs traced, 47 (37%) of them were still in existence by the time of data collection in May 2023. These existing projects were further analyzed and categorized according to project type and the findings were as presented in table 2.

**Table 2**

*ATPPS still in Existence in Schools*

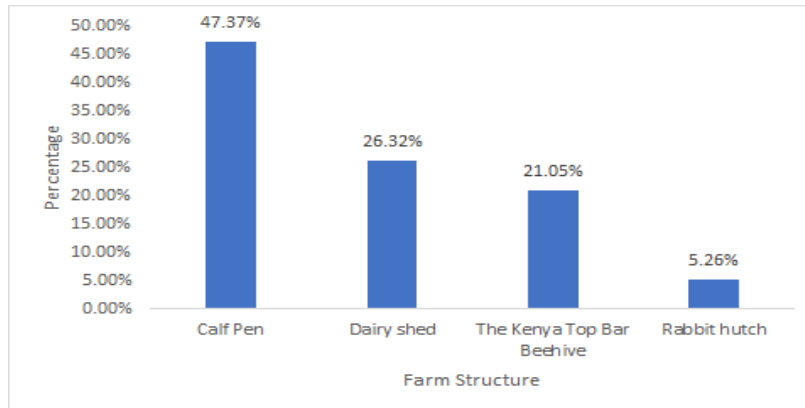
<b>Project Type</b>	<b>Frequency</b>	<b>Percentage</b>
Farm structures	19	40.43
Livestock Production	15	31.92
Weeds and weed Control	6	12.77
Other	3	6.38
Soil and soil fertility	2	4.26
Apiculture	1	2.13
Horticultural crops production	1	2.13
<b>Grand Total</b>	<b>47</b>	<b>100</b>

Although more livestock production projects were traced as per Table 1, there were fewer projects that were still in existence and hence more of the farm structures still existed in schools even in cases where schools had stopped rearing the related livestock. During this tracer study, it was clear that schools would be more willing to maintain and sustain projects that complemented their development plans. For instance, schools interested in rearing livestock for milk or meat production were more likely to maintain livestock related production process and farm structures because they were relevant and financially meaningful to them. Thus, students initiating projects during TP need to link up with the school administration or farm managers or the subject teachers in understanding their future plans especially in the entrepreneurial lens.

Further analysis was done on the existing farm structures in schools to understand the most prevalent type of farm structure and the results were as shown in Figure 1.

**Figure 1**

*Distribution of types of farm structures (n=19)*



Calf pens were the most common farm structures established by students at 47% followed by dairy shed at 26%, construction of Kenya Top bar Hive at 21% and lastly a rabbit hutch at 1%. It is critical to note that students on TP are meant to teach Forms One and Two but for project establishment they can establish a project across the agriculture curriculum. Farm structure is a topic covered in Form Three and referred to, in other topics covered in Form three and four including Livestock production IV (Livestock rearing practices), Livestock Production VI (Cattle Production) and Livestock Production V (Poultry). The broad scope covering farm structures in the curriculum may explain why most students choose farm structures as their projects during TP and the fact that they can exist even when no livestock is being reared by the school.

The livestock production projects established as ATPPs were further analyzed and the results presented in table 3 indicate that Rabbit and Poultry production were the most common at 33% and 26% respectively. This could be explained by the fact that rabbits and poultry are small animals that require little space for shelter, are light feeders and easy to manage and hence are affordable for students on TP to raise as part of their ATPPs. From these findings, it is clear that the more the investment needed to raise a given livestock, the less favorable it becomes among the students on TP.

**Table 3**

*Categories of livestock production projects established by students on TP*

<b>Livestock Production</b>	<b>Frequency</b>	<b>Percentage (%)</b>
Rabbit hutch	5	33.33
Poultry production	4	26.67
Livestock breeds album	3	20
Fish pond	1	6.67
The Kenya Top Bar Beehive	1	6.67
Pig production	1	6.67
<b>Total</b>	<b>15</b>	<b>100</b>

The status of the existing ATPPS was established guided by certain parameters which were measured on a Likert scale the findings were as presented here in table 4: All the existing ATPPs had a mean of above average for all identified indicators to measure their status except for identity. This implies that most of the projects were under good maintenance by the schools through the concerned teachers of Agriculture.

**Table 4**

*Summary analysis of ratings of the parameters*

<b>Status Indicators</b>	<b>N</b>	<b>Mean</b>	<b>Mode</b>	<b>Median</b>	<b>Lower</b>	<b>High</b>
Quality	47	3.83	4	4	1	5
Originality	47	4.06	4	4	1	5
Innovation	47	4.06	4	4	1	5
Creativity	47	3.98	4	4	1	5
Condition	47	4	4	4	1	5
Relevance	47	4.68	5	5	1	5
Connivence	47	4.19	4	4	1	5
Accessibility	47	4.28	4	4	1	5
Identity	47	2.13	1	2	1	5
Storage	47	3.85	4	4	1	5
Maintenance	47	3.32	4	4	1	5

The high mean of the indicators of the status of the existing projects is a clear pointer that institutions were willing to safeguard and sustain ATPPs that they attached value to. Teacher trainees seeking to initiate ATPPs in schools need to gather information of their future plans so that good will towards managing and sustaining the established projects is guaranteed. Besides the 47 ATPPs in existence some stood out in different schools. These cases present the power of PBL which empowers trainees to transform their society by establishing projects that have long term impact to the institutions.

**CASE ONE:**

A bamboo stools established in one of the schools had helped reclaim the school land that faced erosion due to high water levels whenever the region experienced high rainfall. The Bamboo thicket helped change the course of the stream that was widening at a faster rate than the institution was prepared for. As a result, this project has helped the school to sell Bamboo for income, reclaim their waste land and recover land near a water source which the school uses to grow vegetables and arrow roots supplementing the school feeding project.



Plate 1: Bamboo Forest established as a remedy to land wasting

#### CASE TWO:

A teacher trainee established a Cypress and Eucalyptus woodlot within the school in one of the areas regarded as dry. Sharing with the School Principal, he revealed the multiple benefits that ATPPs had brought to the school for years. The success of the woodlot motivated the school principal to transform the whole school compound into an evergreen environment. Those trees provide shade to students studying under them as the region uses the tropical timetable mode. The trees which area variety, make the environment very appealing and conducive for learning. Above all, the woodlot had provided timber which helped roof a block of four classrooms. The amount of money the school saved out of the project initiated by the student on teaching practice in the school was a land mark the school has recorded in their history books. They have also replenished the woodlot and expanded it around the classes providing a barrier to very strong winds that are very prone to the locality.



Plate 2a : Students reading under the trees



Plate b: Wood lots established behind the block of classes

#### Case Three:

A piggery project initiated in one of the host schools was a motivating factor for the school to expand the project from two pigs to a population of over 40. The large litter farrowed by the initial stock encouraged the school to expand the breeding stock and within six months, the project provided pork to students cutting on the cost of meat while taking care of the nutrition of the learners. In addition, management of food waste from the kitchen and dining hall became cheaper

as the pigs would feed on all the left offers reducing the cost of production. Motivated by the outcome the school expanded to poultry and dairy production. The manure obtained was channeled to the school farm improving on vegetable and crop production supplementing the feeding program with organically produced food that has a wealth of benefits to their health.



Plate 3a: Poultry project



Plate 3b: Dairy project

The sampled success cases present the opportunities in using PBT as a strategy in training the Z-generation in preparing them for the world of work. It equips the trainees with multiple competencies critical in solving cross cutting challenges. The solutions provided are also multi-dimension with clustered benefits to multiple stakeholders. In this context, all the cases provided did not just the trainees in learning neither the teachers in using the projects as resources but they were of benefit to the teachers in other subject areas, school administration, parents, support staff, the community around the school among other indirect stakeholders. These multi-dimensional benefits of a solution to an identified problem cannot be underestimated especially in the 21<sup>st</sup> century when the emerging challenges have a dynamic orientation.

To establish these projects in schools, the trainees need the skill of communication to express themselves in consulting on the gaps to be addressed and also in writing a proposal for the project. They also need problem solving skills to be able to identify a problem within the school and provide a possible solution. They also need critical thinking skills to allow them provide a long term solution. Innovativeness is critical since they should provide a solution that is not only original but also that is broad-based to multiple problems. Collaborative skills are essential in project-based learning because success of the project initiated is anchored on how the trainee interacts with those who have a role in the project planning, execution, evaluation and monitoring. These are the transferrable skills that every 21<sup>st</sup> century trainer should champion when training the Z-generation for the opportunities in the agriculture related space.

### **Agriculture Teaching Practice Projects Existence**

A total of 67 teachers of Agriculture who were graduates of AGED were also traced and the aspect usability of ATPPs determined. The distribution of the teachers by gender was 57% to 43% males to females respectively. When asked on whether there were existing ATPPs established by Egerton University students in their school, 81% indicated Yes while 19% indicated No as presented in the figure herein. These projects present a long-term opportunity for use and reuse of teaching resources in a school within the subject and across other related subjects promoting integration of knowledge which is a pillar promoting competency-based training. Further, the 80% of those who

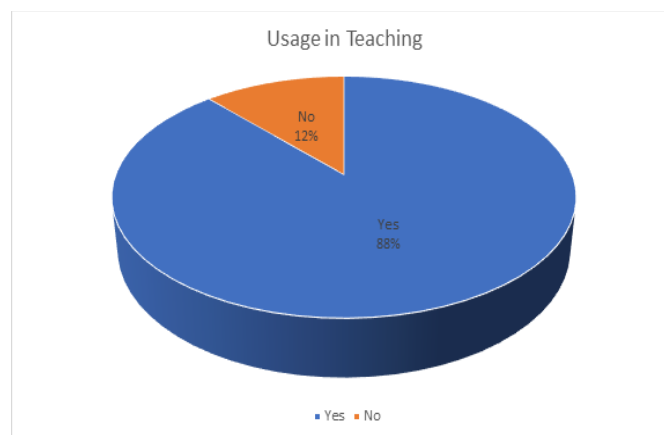
found the agriculture projects by the Egerton AGED students were further asked whether they all existed 44% indicated yes while 47% indicated that only some were still in existence. The findings indicate the need to enhance sustainability mechanism for the ATPPs.

### **Utilization of Agriculture Teaching Practice Projects (ATPPs) in Teaching by the teachers traced onsite**

The over 50% respondents who indicated to have found existing ATPPs in their stations were further asked if they utilized them in teaching. The response towards use was overwhelming with 88% indicating to have utilized them in teaching. The high utilization percentage implying that the ATPPs were still relevant and utilizable as teaching resources in secondary schools. It also indicates a high level of engagement and recognition of the value that these projects bring to the learning environment. The ATPPs serve as valuable teaching resources that contribute to enhancing the learning experience and delivering quality agricultural education.

**Figure 2**

*Use of existing ATPP by teachers*



Asked the topics they taught most using the already existing ATPPs, majority of the respondents indicated to have taught the topics on livestock production and farm structures. This is so, given that the two categories presented most of the already existing projects in schools as presented by the data from the checklist.

Further, asked on the frequency of use of the ATPPs by other teachers, the findings indicated that 40% use by both Biology and Geography teachers while the frequency of use by other subjects was negligible. This indicates that ATPPs have been utilized to enhance biology education, potentially focusing on topics such as agricultural biotechnology, ecosystems, or the interconnections between agriculture and biological systems. Additionally, the use of these projects in teaching Geography subject demonstrates the interrelatedness and integration of knowledge and skills that promote holistic training of the Z-generation.

## Conclusions

From the findings, it is clear that different types of ATPPs existed in schools initiated by AGED teacher trainees from Egerton University mostly from livestock production and farm structures pointing towards durability and the entrepreneurial perspective in the projects established in schools. Additionally, the ATPPs established by AGED teacher trainees from Egerton University in the host schools were utilized as teaching resources within and cross subjects, others were used to generate income, supplement school feeding programme, aesthetic value while others enhanced land reclamation; a pointer to multiplicity of use of projects.

## Recommendations

This paper recommends that students on teaching practice need to be sensitized to initiate projects that are long term in schools and those aligning with the schools' blue print. The trainers of Agriculture too need to explore the multiplicity in utilization of the ATPPs established in their schools for maximum use of such projects in training the Z-generation and exposing them to the opportunities that exist in Project Based Learning.

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