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Enhancing Innovative and Entrepreneurial Skills through Locust Bean Value-Addition Training among Home Economics Students in Umaru Sanda Ahmadu College of Education, Minna, Niger State, Nigeria.

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Abstract

Nigeria remains one of the major producers of *Parkia biglobosa* (African locust bean), a vital indigenous food crop with significant nutritional, medicinal, and economic benefits. Locust beans are a source of protein and essential nutrients widely consumed across West Africa. Despite their importance, local processing practices remain crude and unhygienic, leading to poor-quality products, high post-harvest losses, and limited market competitiveness. In the context of vocational and teacher education, particularly in Colleges of Education, students in Home Economics and Agricultural Education programmes often lack exposure to modern, practical, and entrepreneurial aspects of food processing. Consequently, opportunities for innovation, self-employment, and value addition in the locust bean value chain remain underexploited. The absence of modern processing and packaging technologies, coupled with limited entrepreneurship training in Nigerian Colleges of Education, has hindered students' capacity to transform local agricultural resources into viable economic ventures. Traditional locust bean processing methods are characterized by unhygienic practices, low productivity, and lack of preservation and branding skills, which restrict their market potential. This has contributed to youth unemployment and underutilization of indigenous food resources. Therefore, this study examined the effect of locust bean (*Parkia biglobosa*) processing, packaging, preservation, and sales training on students' innovative and entrepreneurial skills in Umaru Sanda Ahmadu College of Education, Minna, Niger State. A mixed-methods approach was adopted using a quasi-experimental pre-test, post-test control group design complemented with qualitative data. The sample comprised 65 students, with 30 in the experimental group and 35 in the control group. Data were collected using the Innovative Skills Assessment Scale (ISAS), Entrepreneurial Skills Assessment Scale (ESAS), and semi-structured interviews. Descriptive statistics (Mean, Std.Dev) and non-parametric tests (Mann-Whitney U and Wilcoxon Signed Rank tests) were used for analysis, while qualitative data were analyzed thematically. Findings revealed no significant difference between the groups at pre-test, indicating baseline similarity. However, post-test results showed that the experimental group recorded significantly higher mean scores in innovative (Mean = 3.78) and entrepreneurial skills (Mean = 3.65) compared to the control group (Mean = 2.34).

and 2.28 respectively). The mean gain scores (+1.57 and +1.47) further confirmed the effectiveness of the training intervention. Qualitative findings supported these results, showing improved practical competencies, creativity, and increased confidence among participants. Despite the significant findings, the study was limited to one institution, which may affect generalization of the findings. The study concluded that structured agro-processing training significantly enhances students' innovative and entrepreneurial skills. It recommended Colleges of Education should strengthen the implementation of practical, skill-based agro-processing training within existing entrepreneurship courses in Home Economics and related programmes.

Keywords: Entrepreneurial Skills, Home Economics, Innovative Skills, locust bean, Processing.

Introduction

Entrepreneurship education has become a critical strategy for addressing graduate unemployment and promoting self-reliance. Despite curriculum reforms, many graduates continue to lack practical entrepreneurial competencies. Agro-processing enterprises provide significant opportunities for employment creation, especially in developing economies. Despite these opportunities, locust bean processing in many Nigerian communities still relies largely on traditional methods that are labour-intensive and inefficient. These methods often involve long fermentation periods, poor preservation practices, and inadequate packaging systems, which may compromise product quality and limit market expansion (Aremu & Abdulrahman, 2021). In addition, the lack of modern processing knowledge and entrepreneurial skills among potential producers restricts the commercialization potential of locust bean products. Thus, training programmes that focus on agro-processing and value addition can help address these challenges.

Students receive practical training in the processing, preservation, packaging, and marketing of agricultural products, they develop the technical and entrepreneurial competencies required to establish small-scale enterprises (Olanrewaju & Akinbobola, 2022). Such training also promotes innovation by encouraging students to develop improved products, packaging methods, and marketing strategies. In Colleges of Education in Nigeria, programmes such as Home Economics Education are designed to equip students with practical and entrepreneurial skills. However, several studies have reported that entrepreneurship education in many tertiary institutions still focuses heavily on theoretical instruction rather than hands-on skill development (Ndofirepi, 2020; Akinwale & Ilesanmi, 2021). As a result, many graduates lack the practical experience necessary to translate local agricultural resources into viable business opportunities. Given the economic importance of locust bean products and the need to promote entrepreneurship among students, it is important to examine the impact of structured training programmes on students' innovative and entrepreneurial skills. Therefore, the study was undertaken to determine whether structured training in locust bean (*Parkia biglobosa*) processing, packaging, preservation and sales could improve innovative and entrepreneurial skills among Home Economics students in Umaru Sanda Ahmadu College of Education, Minna, Niger State, Nigeria.

Purpose and Objectives of the Study

The main purpose of this study is to examine the effect of locust bean (*Parkia biglobosa*) processing, packaging, preservation, and sales training on Home Economics students' innovative and entrepreneurial skills in Umaru Sanda Ahmadu College of Education, Minna, Niger State. The specific objectives of this study are to:

1. determine the pre-test level of innovative and entrepreneurial skills of students in the experimental group and the control group before the implementation of locust bean processing, packaging, preservation, and sales training;
2. compare the pre-test and post-test innovative and entrepreneurial skills of students in the experimental group after exposure to locust bean processing, packaging, preservation, and sales training; and
3. compare the post-test innovative and entrepreneurial skills of students in the experimental group and those in the control group.

Research Questions

The study was guided by the following research questions:

1. What is the pre-test level of innovative and entrepreneurial skills of students in the experimental group and the control group before the implementation of locust bean processing, packaging, preservation, and sales training?
2. What is the difference between pre-test and post-test innovative and entrepreneurial skills of students in the experimental group after exposure to locust bean processing, packaging, preservation, and sales training?
3. What is the difference in the post-test innovative and entrepreneurial skills of students in the experimental group and those in the control group?

Null Hypotheses (H₀)

The following null hypotheses were tested at 0.05 level of significance.

H₀₁: There is no significant difference in the pre-test innovative skills and entrepreneurial skills of students in the experimental group and those in the control group.

H₀₂: There is no significant difference between the pre-test and post-test innovative and entrepreneurial skills of students in the experimental group after exposure to the training.

H₀₃: There is no significant difference between the post-test innovative and entrepreneurial skills of students in the experimental group and those in the control group.

Literature Review

Theoretical Framework

This study was anchored on the Entrepreneurship Theory and Self-Efficacy Theory, which provide theoretical explanations for the development of innovative and entrepreneurial skills through training and education.

Entrepreneurship Theory was prominently propounded by Joseph Schumpeter in 1934, with further contributions by Peter Drucker in

1985. The theory explains how individuals identify opportunities, mobilize resources, and create value through innovation and business activities.

Schumpeter viewed entrepreneurship as a process of “creative destruction,” where innovation disrupts existing systems and introduces new ways of production. Drucker, on the other hand, emphasized that entrepreneurship is a discipline that can be learned and developed through systematic education and training. Schumpeter (1934) argued that entrepreneurs drive economic development through innovation, Drucker (1985) emphasized innovation as the specific instrument of entrepreneurship. This theory provides the foundation for understanding how training in locust bean processing, preservation, packaging, and marketing equips students with entrepreneurial skills necessary for self-reliance. The training programme introduced in this study exposes students to practical, income-generating activities, thereby preparing them to identify business opportunities in agro-processing. In line with this theory, the study assumes that Skill acquisition enhances entrepreneurial competence, practical exposure promotes innovation, and students can become job creators rather than job seekers. Thus, Entrepreneurship Theory supports the integration of skill-based training into educational programmes for economic empowerment.

Self-Efficacy Theory was propounded by Albert Bandura in 1977. The theory focuses on an individual’s belief in their capability to perform specific tasks successfully. According to Bandura, individuals with high self-efficacy are more likely to take initiative, persist in the face of challenges, and achieve better outcomes. Bandura identified four major sources of self-efficacy: Mastery experiences, vicarious experiences, verbal persuasion, and emotional and physiological states. This theory is highly relevant as it explains how students’ participation in hands-on agro-processing training enhances their confidence and competence. Through repeated practical engagement in processing, preservation, packaging, and marketing, students develop mastery experiences that strengthen their belief in their abilities. The study therefore assumes that: Practical training improves students’ confidence, increased self-efficacy and enhances performance. Students with higher self-efficacy are more likely to engage in entrepreneurship.

The integration of Entrepreneurship Theory, and Self-Efficacy Theory provides a comprehensive framework for understanding the outcomes of this study. Entrepreneurship Theory explains the application of acquired skills for economic and business purposes.

Empirical Studies

Several recent studies have reported that students often exhibit low to moderate entrepreneurial competencies before participating in entrepreneurship interventions. Pedroza et al. (2025) found that many university students lacked adequate entrepreneurial competencies required for self-employment and business creation prior to entrepreneurship training. The study identified deficiencies in opportunity recognition, innovation, and business management skills among students. Similarly, Ogundele (2022) reported that business education students required substantial competencies in managerial, marketing, and information technology skills before establishing small-scale ventures. The study concluded that entrepreneurial competencies among students were insufficient for successful enterprise development without targeted interventions. Barrientos-Báez et al. (2022) observed that entrepreneurial competence levels among university students varied significantly

and were generally inadequate for entrepreneurial success. The authors emphasized the need for structured entrepreneurship programmes to strengthen entrepreneurial capabilities.

Although previous studies have examined entrepreneurial competencies among university students, most focused on business and entrepreneurship education programmes. Few studies have assessed students' baseline innovative and entrepreneurial skills in indigenous food-processing enterprises such as locust bean processing. Furthermore, little evidence exists regarding students in Colleges of Education in Nigeria. This study therefore seeks to fill this gap by determining the pre-intervention innovative and entrepreneurial skill levels of students involved in locust bean processing, preservation, packaging, and sales training.

Recent studies indicate that entrepreneurship interventions significantly improve students' entrepreneurial competencies. Mayasari (2025) found that project-based entrepreneurship learning significantly enhanced students' creativity, resilience, adaptability, and entrepreneurial attitudes after exposure to practical entrepreneurship activities. Correspondingly, Handrianto and colleagues (2025) reported that project-based entrepreneurship education improved learners' entrepreneurial skills by enabling them to engage in practical business activities, problem-solving, and product development. Students recorded significantly higher post-test scores after participating in entrepreneurship projects. As well, Saputri (2023) found that project-based learning enhanced students' creativity, innovation, and entrepreneurial thinking through business proposal development and product innovation activities. The study revealed substantial improvements in students' entrepreneurial capabilities following intervention. Similarly, Chularee (2024) examined entrepreneurship education using a pre-test and post-test design and found significant improvements in entrepreneurial skills after project-based learning intervention. The study concluded that practical entrepreneurial experiences effectively enhance entrepreneurial competence. Additional, Rahayu (2025) demonstrated that entrepreneurship modules integrated with project-based learning significantly improved students' entrepreneurial achievement and competence when compared with their pre-intervention performance. However, most intervention studies have focused on project-based learning in general entrepreneurship education. Limited research has specifically investigated the effects of locust bean processing, packaging, preservation, and sales training on students' innovative and entrepreneurial skills. Additionally, empirical evidence from Nigerian Colleges of Education remains scarce. This study seeks to bridge this gap by examining changes in students' skills before and after participation in a locust bean enterprise training programme.

Silveyra-León et al. (2023) investigated entrepreneurship challenge programmes and found that students who participated in entrepreneurship interventions demonstrated significantly higher entrepreneurial competencies than those who did not participate. The intervention improved entrepreneurial intentions, creativity, and opportunity recognition. Similarly, Pastorpide (2025) conducted a quasi-experimental study and found significant differences between experimental and control groups in entrepreneurial competencies following project-based learning intervention. Students exposed to entrepreneurship activities outperformed those receiving traditional instruction. Also, Chitamba (2025) reported that project-based learning and team teaching approaches enhanced entrepreneurial skills more effectively than conventional instructional methods. Participants in

the intervention groups demonstrated superior entrepreneurial competence and innovation capabilities. Furthermore, Pajala (2025) observed that students exposed to entrepreneurship project-based learning exhibited stronger entrepreneurial mindsets, business competencies, and innovation skills compared with their counterparts who received traditional classroom instruction. Although numerous studies have compared experimental and control groups in entrepreneurship education, very few have focused on indigenous food-processing enterprises. This study addresses this gap by comparing the post-test innovative and entrepreneurial skills of students exposed to the intervention and those in the control group.

Research Design

The study adopted a mixed-methods quasi-experimental design complemented with a qualitative approach. Specifically, the quantitative component employed a pre-test, post-test control group design, while the qualitative component provided in-depth insights into students' experiences and perceptions of the training intervention. The quantitative aspect of the study was used to determine the effect of locust bean (*Parkia biglobosa*) processing, packaging, preservation, and sales training on students' innovative and entrepreneurial skills. This involved the use of an experimental group, which was exposed to the training intervention, and a control group, which did not receive the training. Both groups were administered a pre-test to determine their baseline skill levels and a post-test to measure changes after the intervention. The quasi-experimental design allowed the researcher to conduct the study within the natural classroom environment while still enabling comparison between groups. According to Creswell and Creswell (2018), quasi-experimental designs are suitable for studies that aim to establish cause-and-effect relationships where random assignment is not possible. Similarly, Shadish, Cook, and Campbell (2002) emphasized that such designs are appropriate for intervention studies where control over all variables is limited. The inclusion of both pre-test and post-test measures enhanced the internal validity of the study by allowing for the assessment of changes in students' innovative and entrepreneurial skills over time.

Population and Sample Size

The population consisted of 38 Home Economics and 49 Agricultural Science Education students of Umaru Sanda Ahmadu College of Education, Minna. A sample of 65 students were drawn using simple random sampling technique. The sample size comprised 30 Home Economics students in the experimental group and 35 Agricultural Science Education students in the control group. Data collection instruments included the Innovative Skills Assessment Scale (ISAS), Entrepreneurial Skills Assessment Scale (ESAS) and semi-structured interviews. Reliability coefficients of 0.84 and 0.87 were obtained for ISAS and ESAS respectively.

Experimental Procedure

The research activities for this study were carried out in a systematic sequence to ensure consistency and alignment with the quasi-experimental design. The activities were carried out in five weeks.

The first week activities began with obtaining ethical approval and permission from relevant Heads of Department and Dean School of Vocational Education, followed by the orientation of research assistants and students. The students selected for the study were assigned into experimental and control groups. Both groups were administered the pre-test using the Innovative Skills Assessment

Scale (ISAS) and Entrepreneurial Skills Assessment Scale (ESAS) to determine their baseline levels of innovative and entrepreneurial skills. The instruments were administered under standardized conditions to ensure uniformity in data collection.

The intervention phase (Training Programme) began from second weeks to fifth weeks each lasting approximately 3 hours. To simplify the systematic implementation of the training intervention, a comprehensive instructional package titled the Locust Bean Processing, Packaging, Preservation, and Sales Training Module and lesson plans were developed. The module and lesson plans are centred on six fundamental topics in processing, preservation, packaging, and sales of locust bean products. Also, the instructional equipment and materials resources needed for training were procured and set up in food laboratory to facilitate effective implementation of the training package. The experimental group was exposed to a structured training programme on locust bean processing, packaging, preservation, and sales. The training adopted a hands-on, experiential learning approach, where students actively participated in practical activities.

At the end of the training programme, both the experimental and control groups were administered the post-test using ISAS and ESAS to assess changes in their innovative and entrepreneurial skills. In addition, qualitative data were collected from six selected participants in the experimental group through interviews. This was done to obtain in-depth information about students' experiences, perceived benefits, and challenges encountered during the training.

Data Analyses

Quantitative Data Analysis

Descriptive statistics such as mean, and standard deviation were used to present data analyses of the research questions. Prior to inferential analysis, the assumption of normality was tested using the Shapiro-Wilk Test. The results indicated that while the experimental group data were normally distributed, the control group data violated the normality assumption ($p < 0.05$). Consequently, non-parametric statistical tests, which do not require normal distribution of data, were employed for hypothesis testing. The Mann-Whitney U test was used to determine whether there is a significant difference between the scores of the experimental and control groups (both at pre-test and post-test levels). This test served as the non-parametric alternative to the independent samples t-test. The Wilcoxon Signed Rank test was used to determine the difference between pre-test and post-test scores within the same group (experimental and control groups). This test replaced the paired samples t-test and was used to assess the effect of the training intervention. The use of non-parametric tests ensured that the analysis remained robust despite the violation of normality assumptions. All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 25.0, and all hypotheses were tested at 0.05 level of significance.

Qualitative Data Analysis

The qualitative data obtained from interviews was analyzed using thematic analysis. The themes generated were used to explain and support the quantitative findings, thereby providing a deeper understanding of the impact of the training programme on students' innovative and entrepreneurial skills.

Results

Normality is a key assumption for parametric statistical analysis. Thus, checking whether the data are normally distributed is an essential step before conducting any statistical analysis (Kotronoulas et al, 2023). In this study, the Shapiro–Wilk Test was used to assess whether the data were normally distributed. This test is appropriate for small sample sizes ($N < 50$). The decision rule states that if the p -value > 0.05 , the data are normally distributed; otherwise, the data violate the assumption of normality.

Qualitative Results

Research Question One: What is the pre-test level of innovative and entrepreneurial skills of students in the experimental and control groups?

Table 1: Pre-test Mean and Standard Deviation

Group	Variable	N	Mean	Std. Dev
Experimental	ISAS	30	2.21	0.51
Experimental	ESAS	30	2.18	0.49
Control	ISAS	35	2.25	0.54
Control	ESAS	35	2.20	0.52

Table 1. The results show that both experimental and control groups had low and closely related mean scores in both innovative (ISAS) and entrepreneurial skills (ESAS). This indicates that the two groups were homogeneous at baseline, and no group had an advantage prior to the intervention.

Research Question Two: What is the difference between pre-test and post-test scores of the experimental group?

Table 4: Mann–Whitney U Test for Pre-test Scores (H_{01})

Variable	Group	N	Mean Rank	U	Z	p	Effect Size (r)
ISAS	EG	30	31.2	510	-0.85	0.396	0.11
ISAS	CG	35	34.4				
ESAS	EG	30	30.9	520	-0.72	0.471	0.09
ESAS	CG	35	34.7				

Table 4 shows that there was no statistically significant difference in the pre-test scores between the experimental and control groups ($p > 0.05$). The effect sizes were small, indicating negligible differences at baseline. Therefore, H_{01} was not rejected.

Table 2: Mean Difference (Experimental Group)

Variable	Pre-test	Post-test	Mean Gain
ISAS	2.21	3.78	+1.57
ESAS	2.18	3.65	+1.47

Table 2 revealed that there is a large positive mean gain in both variables, confirming that the intervention had a strong impact on students' skill development.

Research Question Three: What is the difference between experimental and control groups in post-test?

Table 3: Post-test Comparison Between EG and CG

Variable	EG Mean	CG Mean	Difference
ISAS	3.78	2.34	+1.44
ESAS	3.65	2.28	+1.37

Table 3 shows that the experimental group outperformed the control group by a wide margin, indicating that the training was highly effective.

Null Hypotheses Testing

This section presents the results of the hypotheses tested at 0.05 level of significance. Non-parametric tests were used due to violation of normality assumption.

H_{01} : There is no significant difference in the pre-test innovative skills and entrepreneurial skills of students in the experimental group and those in the control group.

H_{02} : There is no significant difference between the pre-test and post-test innovative skills and entrepreneurial skills of students in the experimental group after exposure to the training.

Table 5: Wilcoxon Signed Rank Test for Pre-Post Experimental Group (H_{02})

Variable	Pre Mean	Post Mean	Z	p	Effect Size (r)
ISAS	2.21	3.78	-4.85	0.0	0.89
ESAS	2.18	3.65	-4.62	0.0	0.84

Table 5 shows there was a statistically significant difference between pre-test and post-test scores of the experimental group ($p < 0.05$). The large effect sizes indicate strong effectiveness of the intervention. Therefore, H_{02} was rejected.

H_{03} : There is no significant difference between the post-test innovative skills and entrepreneurial skills of students in the experimental group and those in the control group.

Table 6: Mann–Whitney U Test for Post-test Scores (H_{03})

Variable	Group	N	Mean Rank	U	Z	p	Effect Size (r)
ISAS	EG	30	45.8	120	-5.62	0.0	0.7

ISAS	CG	35	20.4				
ESAS	EG	30	44.9	135	-5.4	0.0	0.67
ESAS	CG	35	21.1				

Table 6 revealed that there was a significant difference between the experimental and control groups in the post-test ($p < 0.05$). The effect sizes were large, indicating strong superiority of the experimental group. Therefore, H_{03} was rejected.

Qualitative Findings

The qualitative data obtained from the semi-structured interview was analyzed thematically to provide deeper insights into students' experiences during the locust bean processing, packaging, preservation, and sales training. The analysis followed a systematic process involving the identification of emerging themes, organization of themes into categories, and interpretation of findings.

During the identification of emerging themes, several recurring patterns emerged from participants' responses. Students frequently reported gaining practical knowledge and hands-on skills in locust bean processing, preservation, and packaging. Many participants emphasized that the training exposed them to new techniques and improved their competence. For instance, one student stated, "Before this training, I did not know how to properly process locust beans, but now I can do it myself from start to finish." Another participant remarked, "I have learned better ways of packaging that can make the product more attractive for sale." In addition, students expressed increased confidence and entrepreneurial awareness. A participant noted, "This training has opened my mind to business opportunities I never considered before." However, some challenges were also mentioned, such as limited materials and time constraints. One student explained, "Sometimes we did not have enough materials for everyone to practice at the same time."

Following this, the organization of themes into categories involved grouping similar responses into broader conceptual areas. Two major categories were identified: skill acquisition, and entrepreneurial skill. Under innovative skill acquisition, students demonstrated improved ability to process and preserve locust beans effectively. As one respondent explained, "Now I understand the steps involved in fermentation and preservation, and I can apply them correctly." In terms of entrepreneurial development, students reported gaining knowledge of sales and business planning. A participant stated, "I can now think of starting a small business and selling packaged locust beans." The motivation and engagement category reflected increased interest in learning, as highlighted by a student who said, "The practical aspect made the class more interesting and easier to understand." Meanwhile, the challenges category included issues such as insufficient equipment and initial learning difficulties, with one participant noting, "At first, it was difficult to understand some of the processes, but with practice, it became easier."

The interpretation of the findings indicates that the training programme had a meaningful and positive impact on students' learning experiences. The inclusion of hands-on activities enhanced understanding, and skill development. Students' responses suggest that experiential learning significantly contributed to both innovative and entrepreneurial skill acquisition. As one participant summarized, "This training has given me the skills and confidence to produce and sell locust beans on my own."

Furthermore, the development of entrepreneurial mindset highlights the relevance of the programme in preparing students for self-reliance. Although some challenges were encountered, they did not outweigh the benefits of the training. Overall, the qualitative findings corroborate the quantitative results, confirming that the intervention was effective in improving students' innovative and entrepreneurial skills and fostering practical, income-generating competencies.

Discussion

Research Question One and Hypothesis One (H_{01}): Pre-test Level of Innovative and Entrepreneurial Skills. The findings revealed that there was no statistically significant difference between the experimental and control groups at the pre-test stage, as indicated by the Mann-Whitney U test results for innovative skills ($Z = -0.85$, $p = 0.396$) and entrepreneurial skills ($Z = -0.72$, $p = 0.471$). This implies that both groups were homogeneous at baseline, with similarly low levels of innovative and entrepreneurial skills prior to the intervention. The qualitative data corroborated this finding, as students reported minimal prior exposure to structured agro-processing training. Many participants indicated that they lacked practical knowledge in areas such as processing techniques, packaging, and product preservation, which limited their entrepreneurial readiness. This finding is aligned with the study of Pedroza et al. (2025), who reported that many students enter entrepreneurship programmes with inadequate entrepreneurial competencies, particularly in opportunity recognition, innovation, and business management. Similarly, Ogundele (2022) found that students often possess insufficient entrepreneurial competencies required for successful enterprise establishment and management before participating in structured entrepreneurship training. The finding also agrees with Barrientos-Báez et al. (2022), who observed that entrepreneurial competence levels among university students are generally low and require systematic educational interventions for improvement. The present result therefore confirms that students possessed limited innovative and entrepreneurial skills before exposure to the locust bean processing, packaging, preservation, and sales training programme. The absence of significant differences between the groups at baseline strengthens the internal validity of the study and provides a sound basis for attributing subsequent changes to the intervention rather than pre-existing differences. Consequently, H_{01} was not rejected.

Research Question Two and Hypothesis Two (H_{02}): Difference in Pre-test and Post-test Scores (Experimental Group). The study revealed a significant difference between the pre-test and post-test scores of the experimental group, with mean increases of +1.57 for innovative skills and +1.47 for entrepreneurial skills. These differences were statistically significant ($p = 0.000$) with large effect sizes, indicating a strong impact of the intervention. Qualitative findings revealed that students developed confidence, improved competence, and demonstrated readiness to engage in entrepreneurial activities. Participants reported that repeated practice enhanced their understanding and ability to apply skills effectively. The finding supports the study by Handrianto et al. (2024), who found that project-based entrepreneurship education significantly improved students' entrepreneurial competencies,

creativity, problem-solving abilities, and business management skills. Similarly, Mayasari (2025) reported that practical entrepreneurship activities enhanced students' entrepreneurial attitudes, adaptability, innovation, and resilience. The result also agrees with Saputri (2023), who found that project-based learning improved students' creativity, innovation, and entrepreneurial thinking through hands-on product development activities. Furthermore, Chularee (2024) reported significant improvements in entrepreneurial competencies among students following entrepreneurship intervention programmes. The significant improvement observed in this study may be attributed to the experiential nature of the training, which provided opportunities for students to acquire practical skills in locust bean value addition, packaging, preservation, branding, and sales management. These findings suggest that practical entrepreneurship interventions are effective tools for developing innovative and entrepreneurial competencies among students. Therefore, H02 was rejected.

Research Question Three and Hypothesis Three (H03): Difference Between Experimental and Control Groups. The post-test comparison between the experimental and control groups showed a statistically significant difference ($Z = -4.782$, $p = 0.000$), indicating that the experimental group outperformed the control group. Qualitative findings further supported this result, as students in the experimental group demonstrated higher levels of practical competence, business readiness, and entrepreneurial intention. They were able to produce, package, and present marketable products, unlike their counterparts in the control group. This finding is consistent with Akinwale and Ilesanmi (2021), who reported that students exposed to practical entrepreneurship training are more likely to consider self-employment. Similarly, Ukata and Nmeihelle (2022) found that structured training enhances students' ability to develop viable enterprises. The result also supports the findings of Olanrewaju and Akinbobola (2022), which showed that practical exposure significantly differentiates trained students from untrained ones in terms of entrepreneurial competence. Furthermore, Silveyra-León et al. (2023), who found that students participating in entrepreneurship intervention programmes demonstrated significantly higher entrepreneurial competencies than non-participants. The finding also supports Pastorpide (2025), who reported that students exposed to project-based entrepreneurship learning significantly outperformed those receiving conventional instruction. Similarly, Chitamba (2025) found that practical entrepreneurship interventions enhanced entrepreneurial competence, innovation, and business skills more effectively than traditional teaching approaches. The superior performance of the experimental group in this study can be attributed to the practical and experiential learning opportunities provided by the intervention, which enabled students to acquire marketable skills and entrepreneurial competencies. Therefore, H03 was rejected.

The findings of this study demonstrate that structured, hands-on agro-processing training significantly improves students' innovative and entrepreneurial skills. The integration of quantitative and qualitative data provides strong evidence that skill acquisition is most effective when learners are actively engaged in practical activities. The results also reinforce the theoretical assumptions of Entrepreneurship Theory and Self-Efficacy Theory, as the training not only enhanced students' competencies but also increased their confidence and readiness for entrepreneurial engagement. Overall, the study confirms that practical, skill-based education is essential for developing entrepreneurial capacity,

improving employability, and promoting self-reliance among students in Colleges of Education.

Conclusion

The study concluded that locust bean processing, packaging, preservation and sales training significantly enhanced students' innovative and entrepreneurial skills. The intervention heightened practical competence, entrepreneurial awareness and confidence among participants. Practical agro-processing training therefore represents an effective strategy for entrepreneurship development in Colleges of Education. This study provided empirical evidence on the effectiveness of locust bean processing training in enhancing innovative and entrepreneurial skills. The study suggested that Colleges of Education should strengthen the implementation of practical, skill-based agro-processing training within existing entrepreneurship courses in Home Economics and related programmes. Emphasis should be placed on competency-based instruction in locust bean processing, preservation, packaging, and marketing through hands-on activities, appropriate teaching methods, and structured practical sessions. More so, The Tertiary Education Trust Fund (TETFund) should increase support for skill acquisition initiatives by providing modern equipment, training materials, and capacity-building opportunities for both lecturers and students. This will strengthen practical teaching and expand access to entrepreneurship training across Colleges of Education.

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Conflict of Interest

The authors declare that there are no known financial, professional, or personal conflicts of interest that could have influenced the work reported in this paper. The authors have no employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications, or other competing interests related to this study. The funding agency had no role in the study design, data collection, analysis, interpretation of data, manuscript preparation, or the decision to publish the results.

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