

Comparative Analysis of Students' Perceived Agripreneurship Competencies and Likelihood to become Agripreneurs depending on Learning Approach: A Report from Uganda

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Abstract

Ensuring food security for a growing populace amidst an aging farmer population together with a decline in youth engagement in agriculture remains a global challenge. This is more distressing for developing countries, such as Uganda, that rely on subsistence farming to meet their food production demands, including job-creation for at least 75% of their populations. Therefore, the need exists to interest young people to lead innovative enterprises as agripreneurs to overcome poverty, food insecurity, and youth unemployment. A quasi-experimental, nonequivalent control group design was used in this study. The findings indicate that a statistically significant ($p < .01$) main effect existed between groups for perceived agripreneurship competencies depending on the instructional approach. Students in the treatment group had higher adjusted marginal mean scores for perceived agripreneurship competencies than members of the counterfactual group, which implied they benefited from a project-based learning approach. However, because the females had lower agripreneurial intentions than males regardless of group, additional research is needed on how to engage and inspire females to pursue agripreneurial ventures, i.e., increase their intentions, if doing such would improve the individuals' economic livelihoods.

Keywords: agripreneurship competencies; food security; livelihoods; project-based learning; youth unemployment

Author Note: Some of the findings in this manuscript were presented by the authors as a research paper abstract at the 2018 Association for International Agricultural and Extension Education (AIAEE) Conference April 16 – 20, Merida, Yucatan, Mexico. Correspondence concerning this article should be addressed to Stephen C. Mukembo, Assistant Extension Professional, University of Missouri Extension, 135 W. Market Street, Warrensburg, MO, USA, 64093; mukembos@missouri.edu

Introduction/Review of Literature

Feeding a global populace approaching 10 billion people by 2050 amidst an aging agricultural producer population, coupled with a decline in youth engagement in agriculture is a concern of many world leaders (Mukembo, 2017). In developed countries, such as the United States, the average age of a farmer was about 57.5 years in 2017 (United States Department of Agriculture, 2019) compared to

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54 years for farmers in many developing countries, including Uganda (Lunghabo, 2016). Further, whereas the overall number of people living in absolute poverty continues to decline across the globe, a majority of the poorest of the poor is growing in Sub-Saharan Africa [SSA] (Wadhwa, 2018). For example, in 2015, more than one-half of the extreme poor across the world lived in SSA, and this trend is projected to reach nine-in-ten by 2030 (Wadhwa, 2018), and most are unemployed or underemployed youth.

According to the International Youth Foundation (2014), during the next 30 years, in excess of 300 million youth in Africa will be in search of employment, with two-thirds living in rural areas. Moreover, in Uganda more than 75% of all college graduates produced annually remain unemployed or underemployed (Arinaitwe, 2014; National Curriculum Development Center [NCDC], 2014). In this regard, the World Bank (2013) estimated that by 2020 more than 10 million Ugandans will be in search of employment if strategies are not developed and implemented to address the jobs challenge. The NCDC, an organization mandated to develop Uganda's education curriculum, attributed this to the current school curriculum which does not meet the country's workforce needs. The curriculum was "initially designed for an elite minority of learners bound for positions within the public service [sector]" (NCDC, 2013, p. 24) rather than today's workforce demands, challenges, and opportunities.

Therefore, due to an aging agricultural population together with high levels of youth unemployment, especially in SSA and regarding Uganda in particular, the need exists to interest young people to create and pursue innovative approaches to agricultural production and its allied sectors (International Labor Organization [ILO], 2014; Montpellier, 2014; Mukembo, 2017). Such initiatives could involve the integration of agriculture and entrepreneurship, as learned through school-based, agripreneurship projects (SAPs), i.e., *agripreneurship*, to overcome poverty, food insecurity, and youth unemployment (Mukembo, 2017). Moreover, acquisition of *agripreneurship competencies* may contribute to achieving the UN's Sustainable Development Goals, including poverty reduction, decent work, and economic growth (ILO, 2014; Mukembo, 2017). *Agripreneurship* involves "the application of entrepreneurial principles to identify, develop, and manage viable agricultural enterprises/projects optimally and sustainably for profit and/or improved livelihoods" (Mukembo & Edwards, 2015a, p. 5). For example, students could apply the knowledge and skills acquired in entrepreneurship courses to recognize opportunities in agriculture, which may lead to the development of viable business ventures for their self-employment while also increasing food production (Mukembo, 2017; Uscanga et al., 2019).

Creating Agripreneurs

To become successful agripreneurs, students ought to acquire the many competencies associated with entrepreneurship (Mukembo, 2017). These include autonomy/independence, creativity, endurance, flexibility, goal setting, high internal locus of control, leadership, market awareness, opportunity recognition, persistence, power or control, risk-taking propensity, self-efficacy, social networks/connections, and being visionary, among other behaviors and skills (Gurol & Atsan, 2006; Mitchelmore & Rowley, 2010; Morris et al., 2013). Such competencies vary across the entrepreneurship literature (Gurol & Atsan, 2006; Neck & Greene, 2011), and it is worth noting that no single trait or competency has been able to predict the profile of a *typical entrepreneur* (Fiet, 2001). Moreover, Low and Macmillan (1988) asserted that "being innovators and idiosyncratic, entrepreneurs tend to defy aggregation. . . . It seems that any attempt to profile the typical entrepreneur is inherently futile" (p. 148).

Entrepreneurial competencies, however, may arise from the interaction of both personality traits and cognitive styles but transcend each while being reflected in entrepreneurs' behaviors, attitudes, knowledge, and values (Morris et al., 2013). Therefore, such may be evaluated through the

observation of behaviors, changes in attitudes, entrepreneurial intentions, and knowledge differences, all of which are subject to acquisition and modification through entrepreneurship education (Blok et al., 2014; Gartner, 1988; Lackeus, 2013). For this reason, scholars have advocated for educational institutions to immerse entrepreneurship students in real-world, hands-on, minds-on learning experiences regarding business planning, venture creation, and enterprise start-ups to acquire practical skills for future business development (Dhliwayo, 2008; Gibb, 1987; Haase & Lautenschläger, 2011).

A number of instructional approaches have been used to equip learners with entrepreneurial knowledge and competencies to increase the likelihood of starting their own ventures. This may involve teachers using a lecture-based method of instruction as well as experiential learning approaches, including project-based learning (PjBL), with each having its own unique benefits and challenges. For instance, if practiced effectively, lecturing can be useful in transmitting a large amount of information in a short time (Bligh, 2000; Nilson, 2010). Instructors also tend to have substantial control over the learning process because they plan and deliver the content with limited input from the learners; and direct instruction can be convenient for large classes where it may not be feasible to use other methods given resource constraints (Bligh, 2000; Hansen & Stephens, 2000; Lake, 2001; Mills, 2012). However, despite its popularity, lecturing often promotes lower-order thinking, including regurgitation of ideas provided by the instructor without critical thinking by the learners, and many tend to soon forget most of what has been taught (Bloom, 1953; Hansen & Stephens, 2000; Menges, 1988; Nilson, 2010). Further, lecturing is ineffective in teaching behavioral skills as well as other life skills that may require direct and active experiences and often does little to evoke emotions likely to trigger changes in individuals compared to methods involving simulations (Bligh, 2000), for example.

Unlike the traditional lecture method, PjBL involves “a comprehensive approach to classroom teaching and learning that is designed to engage students in [the] investigation of authentic problems” (Blumenfeld et al., 1991, p. 369) under the mentorship and guidance of their teachers or other adult facilitators (Nilson, 2010; Thomas, 2000). In PjBL, teachers design the learning activities in ways that motivate and arouse curiosity among the students to learn and to do more (Blumenfeld et al., 1991). This could be achieved by designing projects around problems that students face or are likely to encounter in their local communities (Blumenfeld et al., 1991). Students taught using a PjBL approach are more likely to acquire and apply such skills to solve real-world problems, and, in addition, it promotes the development of interpersonal communication and leadership skills, while fomenting high-order thinking, reasoning skills, and teamwork (Mills & Treagust, 2003; Nilson, 2010; Vogler et al., 2018). PjBL also promotes interdisciplinary transfer of knowledge and skills with the goal of developing workable solutions to emerging challenges (Blumenfeld et al., 1991; Vogler et al., 2018). To this end, PjBL is essentially a *learning by doing* approach with “a goal-directed process that involves inquiry, knowledge building, and resolution” (Thomas, 2000, p. 3). PjBL has been the cornerstone of experiential learning in agricultural education in the United States with the aim of equipping students with workplace skills to succeed in the real-world through a *hands-on, minds-on approach* (Barrick, 1992; Davis, 1911; Phipps et al., 2008). However, despite these advantages, PjBL usually requires substantial amounts of time and resources to implement effectively.

Purpose, Objectives, and Hypotheses

The study’s purpose was to assess students’ perceived *agripreneurship competencies* and their likelihood to become *agripreneurs* in the future depending on the instructional approach received: PjBL featuring agripreneurship versus traditional, lecture-based instruction was tested. The study was guided by three objectives and six null hypotheses: (a) describe students’ selected personal characteristics; (b) compare students’ perceived agripreneurship competencies (skills) based on the instructional approach: (i) Ho: No statistically significant interaction ($p < .05$) existed between group and sex for students’ perceived agripreneurship competencies based on the instructional approach used, (ii) Ho: No

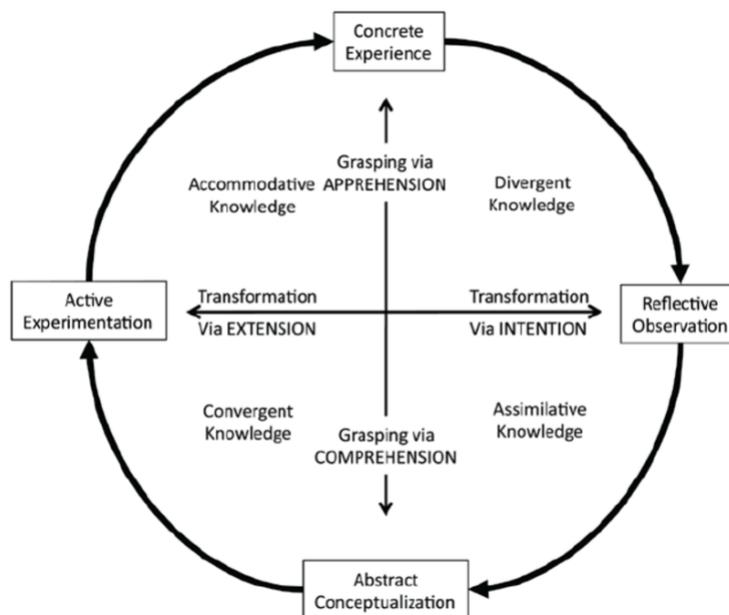
statistically significant differences ($p < .05$) existed between groups for students' perceived agripreneurship competencies based on the instructional approach used, and (iii) Ho: No statistically significant differences ($p < .05$) existed between sexes for students' perceived agripreneurship competencies based on the instructional approach used. Further, (c) compare students' perceptions regarding their likelihood of becoming agripreneurs based on instructional approach: (i) Ho: No statistically significant interaction ($p < .05$) existed between group and sex for students' perceptions regarding their likelihood of becoming agripreneurs based on the instructional approach used, (ii) Ho: No statistically significant differences ($p < .05$) existed between groups for students' perceptions regarding their likelihood of becoming agripreneurs based on the instructional approach used, and (iii) Ho: No statistically significant differences ($p < .05$) existed between sexes for students' perceptions regarding their likelihood of becoming agripreneurs based on the instructional approach used.

Conceptual and Theoretical Frameworks

The overarching conceptual framework for this study was Kolb's (1984) model of experiential learning (see Figure 1). Students acquire entrepreneurial competencies mainly through hands-on, minds-on experiential learning opportunities in real-world environments, including apprenticeships and working on issues and challenges, i.e., through PjBL experiences (Corbett, 2005; Honig, 2004; McMullan & Long, 1987). Kolb (1984) affirmed that such concrete experiences lead to self-reflection, abstraction, and active experimentation, which, in turn, manifests improved self-efficacy (Bandura, 1992). Moreover, Kolb and Kolb (2005) contended that experiential learning involves the construction of knowledge through "creative tension among the four learning modes that is responsive to contextual demands" (p. 194).

Figure 1

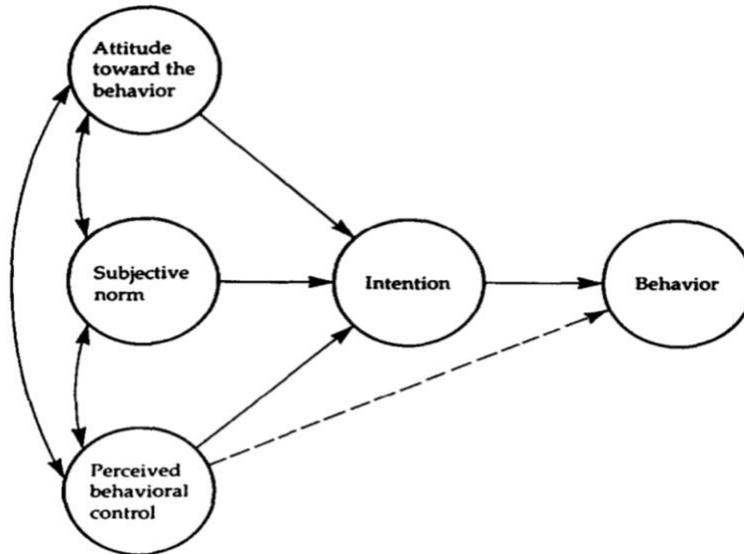
Kolb's Model of the Experiential Learning Process



Note. Adapted from "Experiential Learning: Experience as the Source of Learning and Development" (p. 42), by D. A. Kolb, 1984, Englewood Cliffs, NJ: Prentice Hall, Inc. Copyright 1984 by Prentice Hall, Inc.

On the other hand, Ajzen's (1991) theory of planned behavior (TPB) served as the study's theoretical undergirding. The TPB proposes that an individual's attitudes, perceived behavioral control, as well as the subjective norms associated with a behavior can be used to predict his or her intentions to exercise such behavior (Ajzen, 1991) [see Figure 2].

Figure 2
The Theory of Planned Behavior



Note. Adapted from “The Theory of Planned Behavior” by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes*, 50(2), p. 182 ([https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)). Copyright 1991 by Academic Press. Inc.

Each of the three constructs undergirding the TPB are conceptually independent, but a favorable outlook or attitude toward executing a given behavior is likely to presage intention(s) to actualize such behavior (Ajzen, 1991; Krueger et al., 2000). Moreover, although not without debate, “it seems evident that much of what we consider ‘entrepreneurial’ activity is intentionally planned behavior” (Krueger et al., p. 413), and, similar to other planned behaviors, entrepreneurship can be predicted from an individual’s attitudes and intentions (Bird, 1988; Post, 2014). This study, therefore, sought to measure differences in students’ perceptions about agriprenurship, especially in regard to raising poultry, depending on the instructional approach by which they were taught.

Study’s Design, Student Selection, Treatment, Data Collection and Analysis

A quasi-experimental, nonequivalent control group design was used in this study (Cook & Campbell, 1979). In this design, both groups are “given a pretest and a posttest, but in which the control group and the experimental group do not have pre-experimental sampling equivalence” (Campbell & Stanley, 1966, p. 47); rather, the groups were naturally constituted entities. Nonequivalent control group design is common in education research where it is difficult to randomly assign students to either a treatment or control (counterfactual) group due to several factors, including ethical reasons (Ary et al., 2009).

Although we could not randomly assign participants to counterfactual and treatment groups, we were aware of the various threats to validity this design posed, especially internal and external threats (Ary et al., 2009; Cook & Campbell, 1979). The use of a nonequivalent control group helped to

mitigate some of the threats to internal validity that may exist when using a pretest/posttest design (Ary et al., 2009; Campbell & Stanley, 1966). The threats to internal validity controlled for included history, instrumentation, maturation, mortality, selection, and testing (Campbell & Stanley, 1966).

In this study, 320 Senior Two students participated; they would have been ninth grade pupils in the typical U.S. school system. The students' institutions included four single-sex boarding secondary schools in Uganda, two girls' and two boys' schools. A stratified sampling technique was used to select the participants (Creswell, 2014). Stratified sampling involves dividing the population into subgroups, or strata, based on predetermined characteristics, and randomly selecting participants from each of the subgroups. The strata in this case were based on existing Senior Two groupings known as *streams* in Uganda's public schools. In streams, students are divided into sub-groups based on academic aptitude and performance (Sukhnandan & Lee, 1998). Stratified sampling increases the likelihood that the attributes of interest found in the population will be present in the selected sample with a similar distribution (Ary et al., 2009; Creswell, 2012). Ary et al. (2009) stated that "stratified sampling may give [researchers] a more representative sample than simple random sampling" (p. 154).

The selected students from the four schools were equally divided into treatment and counterfactual groups. The treatment group was made up of students from one boys' school and one girls' school, and the counterfactual group was comprised of students from the other two schools. Participants of each school in the treatment group received 200 day-old broiler chicks as well as the necessary feed and other related inputs to raise their broilers, i.e., the students' SAPs. The students were mentored on how to care for the broiler chicks from day one to being marketed. They also received training on agriprenurship in the context of raising and marketing broiler chickens through a PjBL approach, as facilitated by agricultural and entrepreneurship teachers. On the other hand, the students in the counterfactual group learned about broiler production via traditional, lecture-based instruction from their teachers, and they did not conduct a related SAP. Therefore, each group was taught a course on broiler production and management integrated with entrepreneurship principles for eight weeks, but the teaching approach varied by group. The curriculum used was mandated by Uganda's NCDC (2014) and considered appropriate for students studying agriculture and entrepreneurship.

The study's questionnaire was developed by the researchers and a panel of experts from the Department of Agricultural Education, Communications, and Leadership, and the School of Entrepreneurship at Oklahoma State University who reviewed the instrument for content and face validity; four agricultural and entrepreneurship teachers from Uganda reviewed the instrument for the same purpose. Based on results of a pilot test, the questionnaires construct reliability coefficients varied from 0.69 to 0.84; and post hoc estimates ranged from .52 to .78. Most studies recommend acceptable alphas ranging from .68 to .95, with .70 to .95 cited frequently (Field, 2013; Tavakol & Dennick, 2011). However, Nunnally (1967) asserted: "In the early stages of research on predictor tests or hypothesized measures of a construct, one saves time and energy by working with instruments that have only modest reliability, for which purpose reliabilities of .60 or .50 will suffice" (p. 226). Based on Nunnally's (1967) recommendation, the instrument's construct reliability estimates were considered acceptable for this investigation.

The questionnaire consisted of two parts. The first part included Likert-type items measuring students' perceived agriprenurship competencies. Thirty-three items on the scale measured six constructs, as derived from the entrepreneurship literature regarding entrepreneurial competencies (Bird, 1995; Mitchelmore & Rowley, 2010; Morris et al., 2013; Paladan, 2015) and contextualized to agriculture. A Likert-type item (Boone & Boone, 2012) was also used to measure students' perceived likelihood of becoming agriprenurs. Of the 320 student participants, only 280 provided both pretest and posttest scores for analysis; 40 of the participants responded to only one of the questionnaire administrations, which made their data incomplete and unusable.

A one-way ANOVA indicated that the pretest mean scores between groups for the

agriprenurship competencies were statistically significantly different at $p < .05$, including endurance and risk-taking propensity, being visionary and futuristic oriented, marketing and communication, leadership and management of agricultural ventures, innovativeness and opportunity recognition, and a need for autonomy and control of agricultural ventures, as well as for students' intentions to become agripreneurs. The mean scores of the counterfactual group were statistically significantly higher than the treatment group's scores. Levene's test was not statistically significant at $p < .05$. In addition, a statistically significant and positive correlation existed between the students' pretest and posttest scores. As a result of these differences between groups, and a positive correlation between the groups' pretest and posttest scores, the pretest score for each agriprenurship competency was used as a covariate to adjust for the posttest group mean differences (Cook & Campbell, 1979; Dimitrov & Rumrill, 2003). A Two-Way Analysis of Covariance (between-subjects factor: group [counterfactual, treatment], sex [male, female]; covariate: pretest) was conducted to compare the students' perceived agriprenurship competency and their intentions to become agripreneurs depending on the instructional approach used.

Findings/Results

Objective #1: Students' Selected Personal Characteristics

For the purpose of data analysis, an equal number of male and female students participated in the treatment and counterfactual groups, i.e., 140 participants for each. Both groups had an equal distribution of student participants by sex: 50.00% male and 50.00% female. The ages of the student participants ranged from 12 to 20 years, with the modal age being 14 years (40.36%). The mean age of the students was 14.59 years.

A majority of the students (56.07%) indicated they had not previously enrolled in entrepreneurship as a subject of study; 42.86% had previously enrolled in entrepreneurship as a subject at their schools; 1.07% did not provide a response. Six-in-ten (60.00%) of the students indicated they had *little, very little, or none* regarding knowledge or understanding about agricultural entrepreneurship or agriprenurship; 18.92% reported they had *much to a great deal* of knowledge or understanding of agriprenurship before the study; and 21.07% did not respond to the question about their previous knowledge of agriprenurship.

Objective #2: Compare Students' perceived Agriprenurship Competencies (Skills) Based on the Instructional Approach Used

A Comparison Of Students' Perceived Agriprenurship Competency Regarding The Construct Of Innovativeness And Opportunity Recognition In Agriculture.

The covariates, i.e., pretest scores of students' perceived agriprenurship competency regarding innovativeness and opportunity recognition, were statistically significantly related to their posttest scores for the same [$F(1, 275) = 31.47, p < .001, \eta_p^2 = .10$] (see Table 1). After controlling for the covariate pretest scores, the interaction between group and sex was not statistically significant at $p < .05$ [$F(1, 275) = 0.28, p = .594, \eta_p^2 < .01$], which supported the null hypothesis (see Table 1). No statistically significant main effect of students' sex on their perceived competency regarding innovativeness and opportunity recognition was found at $p < .05$ [$F(1, 275) = 0.04, p = .835, \eta_p^2 < .01$] (see Table 1), which supported the null hypothesis. However, a statistically significant main effect with a large effect size was found at $p < .01$ between group and students' posttest mean scores regarding their perceived competency for innovativeness and opportunity recognition [$F(1, 275) = 61.08, p < .001, \eta_p^2 = .18$] (see Table 1), which did not support the null hypothesis. Students in the treatment group had higher adjusted marginal and observed means for their perceived agriprenurship competency regarding innovativeness and opportunity recognition (*Adj. M* = 26.92, *SE* = .19; *M* = 26.79, *SD* =

2.28) than those in the counterfactual group (*Adj. M* = 24.54, *SE* = .26; *M* = 24.64, *SD* = 3.08).

Table 1

ANCOVA Results for Students' Posttest Scores Regarding Innovativeness and Opportunity Recognition for Agricultural Ventures Depending on the Instructional Approach Used

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared (η_p^2)
Innovativeness and Opportunity Recognition Pretest Scores	205.86	1	205.86	31.47	.000**	.10
Group	399.58	1	399.58	61.08	.000**	.18
Sex	.29	1	.29	.04	.835	.00
Group * Sex	1.86	1	1.85	.28	.594	.00
Error	1799.01	275	6.54			
Corrected Total	2359.57	279				

Note. R Squared = .24 (Adjusted R Squared = .23)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

A Comparison Of Students' Perceived Agripreneurship Competency Regarding The Construct Endurance And Risk-Taking Propensity Associated With Agricultural Ventures.

The covariates, i.e., pretest scores of students' perceived agripreneurship competency regarding endurance and risk-taking propensity, were statistically significantly related at $p < .01$ to their posttest scores for the same [$F(1, 275) = 20.34, p < .001, \eta_p^2 = .07$] (see Table 2). After controlling for the pretest scores, the interaction between group and sex was not statistically significant [$F(1, 275) = 0.92, p = .338, \eta_p^2 < .01$], which supported the null hypothesis (see Table 2). No statistically significant main effect of students' sex on the competency regarding endurance and risk-taking propensity was found at $p < .05$ [$F(1, 275) = 2.68, p = .103, \eta_p^2 = .01$], which supported the null hypothesis (see Table 2). However, a statistically significant main effect with a large effect size was found at $p < .01$ between the students' group and their competency regarding endurance and risk-taking propensity [$F(1, 275) = 90.42, p < .001, \eta_p^2 = .25$], which did not support the null hypothesis (see Table 2). Because of this statistically significant main effect, the null hypothesis was rejected. Moreover, students in the treatment group had higher adjusted marginal and observed means on the agripreneurship competency regarding endurance and risk-taking propensity (*Adj. M* = 25.18, *SE* = .26; *M* = 25.03, *SD* = 3.10) than those in the counterfactual group (*Adj. M* = 21.08, *SE* = .36; *M* = 21.22, *SD* = 4.26).

Table 2

ANCOVA Results for Students' Posttest Scores Regarding Endurance and Risk-Taking Propensity for Agricultural Ventures depending on the Instructional Approach Used

Source	SS	df	MS	F	p	Partial Eta Squared (η_p^2)
Endurance and Risk Taking Propensity Pretest	258.54	1	258.54	20.34	.000**	.07
Group	1149.33	1	1149.33	90.42	.000**	.25
Sex	34.09	1	34.09	2.68	.103	.01
Group * Sex	11.73	1	11.73	.92	.338	.00
Error	3495.59	275	12.71			
Corrected Total	4874.63	279				

Note. R Squared = .283 (Adjusted R Squared = .272)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

A Comparison Of Students' Perceived Agripreneurship Competency Regarding The Construct Of Leadership And Management Of Agricultural Ventures.

The covariates, i.e., pretest scores of students' perceived agripreneurship competency regarding leadership and management of agricultural ventures, were statistically significantly related to their posttest scores for the same [$F(1, 275) = 16.85, p < .001, \eta_p^2 = .06$] (see Table 3). After controlling for the pretest scores, the interaction between group and sex was not statistically significant at $p < .05$ [$F(1, 275) = 0.91, p = .341, \eta_p^2 < .01$], which supported the null hypothesis. Further, no statistically significant main effect of students' sex on their perceived competency regarding the construct of leadership and management of agricultural ventures was found at $p < .05$ [$F(1, 275) < 0.01, p = .967, \eta_p^2 < .01$], which supported the null hypothesis (see Table 3). A statistically significant main effect with a large effect size was found at $p < .01$ between the students' group and their perceived competency regarding leadership and management of agricultural ventures [$F(1, 275) = 56.74, p < .001, \eta_p^2 = .17$], which did not support the null hypothesis (see Table 3). Because of this statistically significant main effect, the null hypothesis was rejected. Students in the treatment group had higher adjusted marginal and observed means for their perceived agripreneurship competency regarding leadership and management of agricultural ventures (*Adj. M* = 35.53, *SE* = .24; *M* = 35.34, *SD* = 2.85) than those in the counterfactual group (*Adj. M* = 32.32, *SE* = .35; *M* = 32.50, *SD* = 4.18).

Table 3

ANCOVA Results for Students' Posttest Scores Regarding Leadership and Management of Agricultural Ventures Depending on the Instructional Approach Used

Source	SS	df	MS	F	p	Partial Eta Squared (η_p^2)
Leadership and Management Pretest	204.64	1	204.64	16.85	.000**	.06
Group	688.92	1	688.92	56.74	.000**	.17
Sex	.02	1	.02	.00	.967	.00
Group * Sex	11.03	1	11.03	.91	.341	.00
Error	3338.99	275	12.14			
Corrected Total	4124.27	279				

Note. R Squared = .190 (Adjusted R Squared = .179)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

A Comparison Of Students' Perceived Agripreneurship Competency Regarding The Construct Of Need For Autonomy And Control Of Agricultural Ventures.

The covariates, i.e., pretest scores of students' agripreneurship competency regarding perceived need for autonomy and control of agricultural ventures, were statistically significantly related to their posttest scores for the same [$F(1, 273) = 7.69, p = .006, \eta_p^2 = .03$] (see Table 4). After controlling for the pretest scores, no statistically significant interaction was found at $p < .05$ between group and sex [$F(1, 273) < 0.01, p = .986, \eta_p^2 < .01$], which supported the null hypothesis (see Table 4). Further, no statistically significant main effect of students' sex on their perceived competency regarding need for autonomy and control of agricultural ventures existed at $p < .05$ [$F(1, 273) = 0.12, p = .728, \eta_p^2 < .01$], which supported the null hypothesis (see Table 4). A statistically significant main effect with a medium effect size was found at $p < .01$ between students' group and their perceived competency regarding need for autonomy and control of agricultural ventures [$F(1, 273) = 16.97, p < .001, \eta_p^2 = .06$] (see Table 4). Because of this statistically significant main effect, the null hypothesis was rejected. Students in the treatment group had higher adjusted marginal and observed means for the agripreneurship competency regarding need for autonomy and control of agricultural ventures (*Adj. M* = 22.20, *SE* = .20; *M* = 22.11, *SD* = 2.41) than those in the counterfactual group (*Adj. M* = 20.90, *SE* = .24; *M* = 20.99, *SD* = 2.78).

Table 4

ANCOVA Results for Students' Posttest Scores Regarding Autonomy and Control of Agricultural Ventures Depending on the Instructional Approach Used

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared (η_p^2)
Autonomy and Control Pretest	50.79	1	50.79	7.69	.006**	.03
Group	112.03	1	112.03	16.97	.000**	.06
Sex	.80	1	.80	.12	.728	.00
Group * Sex	.00	1	.00	.00	.986	.00
Error	1802.44	273	6.60			
Corrected Total	1952.89	277				

Note. R Squared = .077 (Adjusted R Squared = .064)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

A Comparison Of Students' Perceived Agripreneurship Competency Regarding The Construct Of Marketing And Communication Of Agricultural Ventures.

The covariates, i.e., pretest scores of students' perceived agripreneurship competency regarding marketing and communication of agricultural ventures, were statistically significantly related to their posttest scores for the same [$F(1, 270) = 8.91, p = .003, \eta_p^2 = .03$] (see Table 5). After controlling for the pretest scores, the interaction between group and sex was not statistically significant at $p < .05$ [$F(1, 270) = 3.59, p = .059, \eta_p^2 = .01$], which supported the null hypothesis (see Table 5). No statistically significant main effect of students' sex on their perceived competency regarding marketing and communication of agricultural ventures existed at $p < .05$ [$F(1, 270) = 0.80, p = .373, \eta_p^2 < .01$], which supported the null hypothesis (see Table 5). A statistically significant main effect with a medium effect size was found at $p < .01$ between students' group and their perceived competency regarding marketing and communication of agricultural ventures [$F(1, 270) = 26.23, p < .001, \eta_p^2 = .09$] (see Table 5). Because of this statistically significant main effect, the null hypothesis was rejected. Students in the treatment group had higher adjusted marginal and observed means for the agripreneurship competency regarding marketing and communication of agricultural ventures (*Adj. M* = 21.86, *SE* = .20; *M* = 21.73, *SD* = 2.32) than those in the counterfactual group (*Adj. M* = 20.07, *SE* = .28; *M* = 20.20, *SD* = 3.33).

Table 5

ANCOVA Results for Students' Posttest Scores Regarding Marketing and Communication of Agricultural Ventures Depending on the Instructional Approach Used

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared (η_p^2)
Marketing and Communication Pretest	70.38	1	70.38	8.91	.003**	.03
Group	207.30	1	207.30	26.23	.000**	.09
Sex	6.29	1	6.29	.80	.373	.00
Group * Sex	28.37	1	28.37	3.59	.059	.01
Error	2133.80	270	7.90			
Corrected Total	2402.71	274				

Note. R Squared = .112 (Adjusted R Squared = .099)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

A Comparison Of Students' Perceived Agripreneurship Competency Regarding The Construct Of Being Visionary And Futuristic Oriented About Agricultural Ventures.

The covariates, i.e., pretest scores of students' perceived agripreneurship competency regarding being visionary and futuristic oriented about agricultural ventures, were statistically significantly related to their posttest scores for the same [$F(1, 271) = 22.04, p < .001, \eta_p^2 = .08$] (see Table 6). After controlling for the pretest scores, no statistically significant interaction existed at $p < .05$ between group and sex [$F(1, 271) = 0.07, p = .793, \eta_p^2 < .01$], which supported the null hypothesis (see Table 6). No statistically significant ($p < .05$) main effect of students' sex on their perceived competency of being visionary and futuristic oriented regarding agricultural ventures was found [$F(1, 271) = 1.55, p = .214, \eta_p^2 = .01$], which supported the null hypothesis (see Table 6). A statistically significant main effect with a large effect size was found at $p < .01$ between students' group regarding the perceived competency of being visionary and futuristic oriented about agricultural ventures [$F(1, 271) = 43.15, p < .001, \eta_p^2 = .14$] (see Table 6). Because of this statistically significant main effect, the null hypothesis was rejected. Students in the treatment group had higher adjusted marginal and observed means for the agripreneurship competency of being visionary and futuristic oriented about agricultural ventures (*Adj. M* = 13.40, *SE* = .12; *M* = 13.32, *SD* = 1.46) than those in the counterfactual group (*Adj. M* = 11.86, *SE* = .21; *M* = 11.93, *SD* = 2.43).

Table 6

ANCOVA Results for Students' Posttest Scores Regarding Being Visionary and Futuristic Oriented about Agricultural Ventures Depending on the Instructional Approach Used

Source	SS	df	MS	F	p	Partial Eta Squared (η_p^2)
Being Visionary and Futuristic Oriented Pretest	82.67	1	82.67	22.04	.000**	.08
Group	161.90	1	161.90	43.15	.000**	.14
Sex	5.82	1	5.82	1.55	.214	.01
Group * Sex	.26	1	.26	.07	.793	.00
Error	1016.74	271	3.75			
Corrected Total	1234.81	275				

Note. R Squared = .177 (Adjusted R Squared = .164)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

Objective #3: Comparative Analysis of Students' Perceptions regarding their Likelihood of becoming Agripreneurs based on Instructional Approach used

The covariates, i.e., pretest scores of students' likelihood to become agripreneurs, were statistically significantly related to their posttest scores for the same [$F(1, 259) = 41.18, p < .001, \eta_p^2 = .14$] (see Table 7). After controlling for the pretest scores, no statistically significant interaction at $p < .05$ was found between the group and sex of students regarding their likelihood to become agripreneurs depending on the instructional approach used [$F(1, 259) = 1.58, p = .210, \eta_p^2 = .01$] (see Table 7). Based on this finding, the null hypothesis was accepted. A statistically significant main effect with a small effect size was found at $p < .01$ between the groups and the students' likelihood to become agripreneurs [$F(1, 259) = 9.85, p = .002, \eta_p^2 = .04$] (see Table 7). Therefore, the null hypothesis was rejected. The adjusted marginal and observed means for the treatment group (*Adj. M* = 4.24, *SE* = .07; *M* = 4.30, *SD* = .80) were statistically significantly higher than for the counterfactual group (*Adj. M* = 3.93, *SE* = .08; *M* = 3.89, *SD* = .88). In addition, a statistically significant main effect with a small effect size at $p < .01$ existed for students' sex and their likelihood to become agripreneurs [$F(1, 259) = 11.29, p = .001, \eta_p^2 = .04$] (see Table 7). Based on this finding, the null hypothesis was rejected. The adjusted marginal and observed mean scores for males were higher in both the counterfactual group (*Adj. M* = 4.15, *SE* = .09; *M* = 4.08, *SD* = .73) and the treatment group (*Adj. M* = 4.34, *SE* = .11; *M* = 4.37, *SD* = .90) than for females in both groups (counterfactual: *Adj. M* = 3.71, *SE* = .12; *M* = 3.69, *SD* = .97; treatment: *Adj. M* = 4.14, *SE* = .09; *M* = 4.22, *SD* = .69).

Table 7*ANCOVA Results for Students' Posttest Scores Regarding their Likelihood to Become Agripreneurs*

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared(η_p^2)
Likelihood to become Agricultural Entrepreneur Pretest	24.60	1	24.60	41.18	.000**	.14
Group	5.88	1	5.88	9.85	.002**	.04
Sex	6.75	1	6.75	11.29	.001**	.04
Group * Sex	.94	1	.94	1.58	.210	.01
Error	154.73	259	.60			
Corrected Total	196.17	263				

Note. R Squared = .211 (Adjusted R Squared = .199)

**Statistically significant difference at $p < .01$. Effect sizes Partial Eta Squared (η_p^2): Small effect size = .01; medium effect size = .06; large effect size = .14 (Cohen as cited in Lakens, 2013).

Conclusions

No statistically significant interaction ($p < .05$) was revealed between group and sex, nor did a statistically significant difference exist between sexes for students' perceived agripreneurship competencies depending on the instructional approach. However, a statistically significant main effect ($p < .01$) was found between groups for students' perceived agripreneurship competencies depending on the instructional approach used; therefore, this null hypothesis (ii) for objective two was rejected. Students in the treatment group had higher adjusted marginal mean scores for perceived agripreneurship competencies than members of the counterfactual group, which implied they benefited from the PjBL approach. This finding supports the work of Heinonen and Poikkijoki (2006) and Morris et al. (2013) who argued that entrepreneurial competencies and entrepreneurship in general, similar to other skills, could be acquired through education and practice. In this case, the treatment group students had the opportunity to implement what they had learned in the form of an agripreneurship project, i.e., experiential learning (Kolb, 1984), which likely increased their perceived agripreneurship competency, as reflected by the study's findings.

Regarding objective three, two of the three null hypotheses were rejected. No statistically significant interaction ($p < .05$) was found between group and sex for students' intentions regarding their likelihood to become agripreneurs depending on the instructional approach, which supported the related null hypothesis (i). However, a statistically significant main effect ($p < .01$) was revealed between groups and the students' likelihood to become agripreneurs. Students in the treatment group had higher adjusted marginal mean scores indicating they were more likely to become agripreneurs than the counterfactual group students. The increased likelihood of students in the treatment group to become agripreneurs is supported by the findings of other researchers (Bird, 1988; Honig, 2004; Peterman & Kennedy, 2003). They argued that exposure to entrepreneurial activities at an early age, including entrepreneurial role models, can influence individuals having more positive attitudes toward entrepreneurship and the likelihood of starting their own ventures in the future. According to Krueger et al. (2000), "[i]ntentions are the single best predictor of any planned behavior, including

entrepreneurship” (p. 412). Moreover, an individual’s intentions are central to actualizing a given behavior, a position supported by the TPB (Ajzen, 1991; Ajzen & Madden, 1986; see Figure 2).

In addition, statistically significant main effects ($p < .01$) were found for students’ sexes and their likelihood to become agripreneurs. The adjusted mean scores for males in both groups were higher than for females in either group. Regardless of their group, males were more likely to become entrepreneurs. These findings led to rejection of the respective null hypotheses, i.e., ii and iii, related to objective three. A discrepancy in the likelihood to pursue agripreneurship opportunities depending on an individual’s sex has been reported by other researchers who found that males were more likely than females to pursue entrepreneurial opportunities (Amo, 2014; Coleman & Robb, 2017; Miller, 2017). This was attributed to the supposition that women tend to have much lower entrepreneurial self-efficacy, which impacts their related intentions (Kirkwood, 2009; Sweida & Reichard, 2013). Moreover, according to Kickul et al. (2008), “there is some evidence to suggest that girls appear more aware of deficiencies in their skills as potential entrepreneurs than boys” (p. 324). Also, fewer women compared to men are likely to prefer being self-employed “largely because they don’t see other women entrepreneurs as role models” (Miller, 2017, para. 5). Further, Souitaris et al. (2007) reported a statistically significant and positive relationship between an individual’s attitude toward and ability for self-employment, including views on society’s subjective norms regarding such (Ajzen, 1991) and the person’s intention to be self-employed. Bandura (1992) affirmed that perceived lower self-efficacy was more likely to impact women’s career aspirations than men, especially in areas that have been traditionally dominated by males, including entrepreneurial endeavors (Wilson et al., 2007).

Recommendations for Practice

The need exists to promote more awareness about agripreneurship and related opportunities to students through school programs as well as community outreach initiatives. In particular, students ought to be exposed to prosperous livelihood opportunities in the agricultural sector. The pursuit of entrepreneurial opportunities in agriculture, including value-addition, should help to reduce the levels of youth unemployment and improve the food self-sufficiency of local communities in Uganda as well as other nations with similar challenges. If students recognize and evaluate these opportunities as a way to increase their incomes, they may be more likely to pursue such. This could also have *spillover effects* in local communities leading to improved livelihoods and enhanced food security for a global population expected to reach almost 10 billion by 2050 (Department of Economic and Social Affairs – United Nations, 2017).

Though curriculum reforms are being undertaken by the Ministry of Education and Sports in Uganda, through the NCDC, findings of this study support the need to ensure such reforms are undertaken expeditiously and in effective ways. The focus of these reforms should be to integrate related or potentially complementary subjects, such as agriculture and entrepreneurship, with a focus on skills development and practical applications of content, including students using the acquired skills to start their own ventures to address Uganda’s unemployment crisis (NCDC, 2013, 2014).

Further, as the NCDC works to reform and integrate the existing school curriculum in Uganda, professional development opportunities should be provided to teachers to ensure they understand the benefits and challenges that may arise from such integration (Mukembo & Edwards, 2015b; Pearson et al., 2010). This professional development could involve teachers working as teams to identify complementary areas in their respective subjects for which to develop teaching ideas applicable to real-life situations that include problem solving and PjBL. For example, a mathematics teacher helping students understand the concepts of perimeter and area could partner with an agriculture instructor to teach a fencing lesson that applies mathematical concepts to determine a field’s size and the number of fence posts and rolls of barbed wire needed to enclose the field. In addition, the input of students’

parents and the representatives of business and industry in their local communities should be sought when developing new curriculum.

Females in this study, irrespective of their grouping, had lower intentions to become agripreneurs than their male peers. Therefore, a need exists to engage more female agripreneurial role models to mentor young girls to improve their perceived self-efficacy about agripreneurship. This could be achieved through Youth-Adult partnerships, whereby young girls partner with appropriate adult female role models to collaborate on entrepreneurial projects involving agriculture to build skills and improve their entrepreneurial self-efficacy (Mukembo & Edwards, 2020). Without additional female role models to inspire young women to pursue entrepreneurship, a sector traditionally dominated by men, fewer female entrepreneurs are likely to result; a phenomenon that Coleman and Robb (2017) attributed to low self-efficacy and cultural barriers such as subjective norms (Ajzen, 1991).

Overall, students from the treatment group who experienced PjBL had higher mean scores for perceived agripreneurship competencies and were more likely to become agripreneurs than those in the counterfactual group. Therefore, PjBL should be increasingly integrated into the school curriculum to improve the likelihood of students understanding agripreneurial concepts and gaining the competency to apply such to solve livelihood challenges in their communities for themselves and others (Mukembo, 2017).

Recommendations for Additional Research and Discussion

The female students in this study had lower agripreneurial intentions than males irrespective of group. Therefore, additional research is needed regarding how to engage and inspire females to pursue agripreneurial ventures, i.e., increase their intentions (Ajzen, 1991), if doing that would improve their economic livelihoods (Feed the Future, 2011). Future studies should also compare the effectiveness of other learning methods and the objectives of agripreneurship education, especially approaches supporting the principles of experiential learning theory (Kolb, 1984) [see Figure 1].

Further, a need exists to conduct longitudinal or follow-up investigations with students who were participants in this study to determine how many actually became agripreneurs, and to evaluate how the knowledge and skills they acquired from the related learning experience may have impacted them and their communities. Such investigations could involve cohort or panel studies (Creswell, 2014).

The finding that females had lower agripreneurial intentions compared to their male counterparts, irrespective of group, left the researchers to conjecture whether social norms significantly impacted their interests in pursuing agripreneurship ventures, especially due to males tending to dominate entrepreneurship. Socio-cultural norms, which may include gender stereotypes, can substantially influence individuals' perceptions of entrepreneurship and impact the type of opportunities they choose to pursue depending on the societal context (Pihie & Bagheri, 2013; Şeşen & Pruett, 2014; Sweida & Reichard, 2013). Additional research is warranted to further explore the impact of such beliefs on females' perceptions and their intentions to pursue agripreneurship ventures, as either inspired or constrained by subjective norms (Ajzen, 1991; see Figure 2).

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