

Influence of School Garden Learning Approach on Academic Development of Global Service-Learners

Abstract

Students need to develop cross-cultural awareness and understanding, which has led educational institutions to create high-impact global programs to enhance their learning. Global service-learning, a U.S.-based pedagogy, interconnects service-learning, study abroad, and international education programs. A service-learning program of our study in Uganda was founded on the school garden approach. The Center for Sustainable Rural Livelihoods (CSRL), Iowa State University, and Makerere University adopted school gardens as a feasible approach to fulfill the service-learning curricular objectives and meet CSRL's goal of solving undernutrition in schools using gardens as an outdoor learning laboratory and for products in school lunches. This study sought to determine the influence of service-learning program activities on alumni's academic development. Alumni (n = 274) from 2006-2019 completed a self-administered questionnaire through Qualtrics where 94.2% responded. A principal components analysis (PCA) was employed, aligning activities into three components. The first component loaded school gardening, bi-national team projects, arrival orientations, farmer field visits, and school teaching assistance, depicting alumni's community engagement in reciprocal learning. Component two loaded journaling/logbooks, critical reflections, and presentations, depicting alumni's reflexive actions resulting in cognitive development through documenting and confronting their assumptions about their service-learning activities. Component three loaded co-curriculars, tours and travels, and social parties, portraying alumni's social life that provided opportunities to learn about distinct cultures. Pre-departure orientations loaded well on Iowa State University alumni's PCA which mitigated culture shocks while in Uganda. Alumni could benefit overall from more instructor-led cognitive development activities whereby they could both learn from and question their activities.

Keywords: academic development; cognitive development; community engagement and reciprocity; global service-learning; school gardens; socialization.

Introduction

Encouraging students to participate in high-impact service-learning programs is one way of improving their lifelong learning. Service-learning is a teaching pedagogy that links universities to communities and provides for the transformation of learning in higher education institutions [HEIs] (Olson & Brennan, 2017; Preece, 2017; 2018). A service-learning model was adopted because it closely aligns with “the centrality of working *with* not just *in* or *for* the community” (Bringle & Clayton, 2020, p. 48). In the U.S., the National Service Learning Clearinghouse defines service-learning as “a teaching and learning strategy integrating meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities” (Ryan, 2012, p. 4). Other U.S. service-learning definitions (see: Bringle & Clayton, 2012; Felten & Clayton, 2011; Furco & Norvell, 2019); combined with European (Cayuela, 2020), Asian (Ma et al., 2019), Latin American (Bringle & Clayton, 2020; Regina & Ferrara, 2017), and African (Diaz-Pareja, 2020; Preece, 2017; 2018) descriptions provide seven key components embedded in the service-learning pedagogy. These include academic nature, reflective actions, critical thinking, community engagement, personal growth, student growth, and community partnership which differentiates service-learning from other forms of community service including volunteerism (Ash & Clayton, 2009; Sturgill & Motley, 2014).

Service-learning has been part of the history of HEIs in the U.S. more than in any other region of the world (Bringle & Hatcher, 2011; Ma et al., 2019). In the U.S., service-learning and its relevance to

institutions in advancing the knowledge of students was described by Eyler and Giles (1999). Their scholarly book resulted from the urgency to respond to the growing number of service-learning practitioners whose learning outcomes were not developed or intentionally designed. The required service-learning component as part of students' course and graduation requirements has grown over time in the U.S. HEIs (Jones et al., 2008; Moely & Ilustre, 2011). Service-learning is relevant at the peak age of 18-23 years (Wilsey, 2013) when students are undergoing formative development. Students often are enrolled in higher education at these ages, and HEIs are responsible for assisting in student development of cross-cultural competencies.

Previous research showed that university students as service-learners have high academic retention and graduation rate (Bringle et al., 2010; Lockeman & Pelco, 2013). They also have a high possibility of advancing from a lower level to higher levels of student classification, especially among African American students in college (Kuh et al., 2008). Participating students have a higher propensity to continue to graduate school persistently, and with a higher satisfaction ranking for their college education than their counterparts who do not participate in service-learning (Bringle et al., 2010; Lockeman & Pelco, 2013; Luo & Jamieson-Drake, 2015). Due to efforts to increase global competencies, HEIs further internationalized their high-impact programs including service-learning.

As a U.S. pedagogy, international service-learning (ISL) was conceptualized as an interconnection between service-learning, study abroad, and international education (Bringle & Hatcher, 2011). Service-learning brings in four core facets: 1) academic activity bearing credit, 2) community service, 3) reflective elements, and 4) civic responsibility. Studying abroad brings in the elements of classical and liberal education involving the ability of students to afford international travel to go and learn about other countries' linguistics, art, culture, and customs; and maintenance of diplomatic relations between nations (Hovey & Weinberg, 2009; Hovland et al., 2009; Kiely, 2011; Paige et al., 2009). International education brings two main elements 1) technical and 2) topical aspects (Bringle & Hatcher, 2011). The technical aspect emphasizes student learning, for instance how contracts are negotiated between nations in the provision of, for instance, financial services, health, or agriculture. The topical aspect involves learning a specific theme of another country or region, for instance, agricultural systems, geography, and/or culture on how it affects its resources. The service-learning approach brings a study abroad program and international education into an experiential learning model for students to learn in the international community and become immersed in another culture (Bringle & Hatcher, 2011).

The Uganda Service-Learning Program

In this study, a service-learning program was held in Uganda and included three partner organizations. The partnership was among Makerere University (MAK), Iowa State University (ISU), and non-government organizations (NGO) [i.e., Center for Sustainable Rural Livelihoods (CSRL)], that work(ed) with Volunteer Efforts for Development Concerns between 2005-2014 and Iowa State University Uganda Program (ISU-UP), 2014 to date (Butler & Acker, 2015). The ISU-UP implements development programs of the CSRL, based in ISU's College of Agriculture and Life Sciences. Service-learning is an academic program of the college led by an Associate Director of the CSRL program who is an ISU faculty member. The program was conceptualized in 2005 out of the participatory needs assessment between the stakeholders of MAK and ISU Colleges of Agriculture, as well as national and local entities and communities in Uganda (Nonnecke et al., 2015). School garden programs at primary schools were determined as the most feasible activity that could fulfill the learning objectives of university students and their curricula. It also met CSRL's goal of assisting in agricultural educational programs in a community where agriculture is the main activity for subsistence and smallholder commerce. School garden programs could also help reduce the undernutrition of children in primary schools with the school garden products invested in school lunch programs (Byaruhanga, 2016; Kugonza et al., 2016; Nonnecke et al., 2015; 2016). Service-learning started as a six-week program in 2006 for both MAK and ISU but increased to 10 weeks

in 2007 for MAK only to fulfill its College of Agriculture and Environmental Sciences field internship requirement.

A school garden approach was adopted by the Uganda service-learning program to serve as an outdoor learning laboratory for university students and primary school pupils (FAO, 2005, Nonnecke et al., 2015; Kugonza et al., 2015). Being outdoors creates lessons that are child-centered when they physically experience the classroom-learned concepts. School gardens have the potential for knowledge transfer to pupils and students while at school and by pupils to their homes and communities. The community can visit school gardens during school-based field days for knowledge exchange. These various levels of students' engagement in school garden activities lead to social growth (Williams & Dixon, 2013), academic learning, good health, and community engagement (Blair, 2009; Miller, 2007).

Studies have assessed the impact of the Uganda service-learning's school gardens approach on pupils' nutrition adequacy (Byaruhanga, 2016) and academic performance (Snodgrass, 2012); and the promotion of school-based agricultural education among elementary school pupils in Kamuli District, Uganda (Ikendi, 2022; Duerfeldt, 2016). However, research has not assessed the impact of a service-learning approach on the academic development of university alumni who participated in programs since 2006. This study aimed to assess the academic development of alumni, conceptualized as alumni learning from the various school gardens and related service-learning program activities as succinctly described in Table 1.

Table 1

Description of the Service-Learning Activities that Alumni from Makerere University (MAK) and Iowa State University (ISU) Participated In During Their Service-Learning in Kamuli, Uganda.

Activity	Summary Description
Pre-departure Orientations	A pre-reflective stage is conducted by program instructors and guests including alumni in the spring semesters both at MAK and ISU. The goal is to create awareness of field activities, programs, community, precautions, and expectations in learning. Students also write and share their biographies.
Arrival Orientation in Kamuli District	A brief visit and presentation by the local physician and Busoga cultural leaders and an initial visit to the primary schools are included. Students are oriented on the program's residential etiquettes including room assignments, safety precautions like fire, meal time, briefings, and planning for activities.
School Gardening	Students assist in establishing gardens of vegetable and food crops, orchards and tree gardens, and assorted herbaria. Routine activities include bush clearing, setting up nurseries and seedbeds, transplanting, watering, weeding, harvesting crops, and training pupils.
Bi-national Team Projects	Concept notes on projects are developed, required materials are sourced locally, and projects are implemented. Bi-national team projects in schools include topics of crop and livestock production, irrigation, sanitation, grain storage, school feeding and nutrition, agroforestry, and composting.
Assist with School Teaching	Teaching plans in agriculture, integrated science, math, and English and assessments of lessons are designed. Where applicable students conduct practical lessons in school gardens and/or bi-national projects.

Farmer Field Visits	Students work with farmers on several planned activities that may include activities like harvesting or threshing of crops; planting or pruning of fruit and vegetable crops; and renovation of livestock houses. Conversations and discussions with farmers about farming practices and their rationale occur.
Critical Reflections	Guided reflections and discussions on projects, fieldwork, and critical issues that influence community development are led by faculty. Question prompts, facilitators, and guided rubrics on teaching, school gardens, professionalism, and attitude are provided to students in their service-learning itinerary.
Journaling or Logbooks Writing	Documentation of the routine activities planned and/or accomplished in their learning lessons is required. Journals are associated with ISU students and logbooks are associated with MAK students. These materials are graded on a routine basis by the field and academic supervisors of students and also form learning portfolios.
Presentations	Students share their accomplishments in six weeks of working in a bi-national team. They prepare PowerPoints on the progress and recommendations of each project which are presented at MAK or the CSRL Office in Kamuli. Presentations are done mid-July a day before ISU students depart Uganda. Summary team presentations are given at each university in the following fall semester after the service-learning experience.
Co-curricular Activities	These activities are arranged by students and include indoor and outdoor sports, games, music, dance, and drama, which they do with their facilitators and pupils. For the years 2013-2017, students painted a mural depicting the most identifying activity of the year which becomes their symbol, such as a plant or animal.
Tours and Travels	Students participate in tours and travels to learn about the history, culture, and natural resources of Uganda. Students visit national parks, the source of the Nile River, mountain waterfalls, geographic features, tourist markets, and cultural sites and programs, such as the Ndere Cultural Troupe. All tours are included in the service-learning itinerary.
Social Parties	Students organized events to celebrate the binational nature of their program. Notables are celebrations of American independence in July where national anthems are sung, and farewell ceremonies at schools. Students cook and share traditional foods depicting their culture with peers. They participate in a variety show of “Kamuli Idol” where they perform songs, dances, and literary works related to their activities.

Source: Byaruhanga (2016); Ikendi (2022); Ikendi et al. (2022); Kugonza et al. (2015); and Nonnecke et al. (2015; 2016; 2018).

Theoretical Framework

This study was based on experiential learning theory, with the service-learning activities implemented through the school gardening and related community activities. The adoption of experiential learning pedagogies became an effective teaching model that engages and cultivates students’ deep learning, long long-term knowledge retention with hands-on experiences during the learning process (Baker & Robinson, 2018; Kolb & Kolb, 2017). Experiential learning highlights the fundamental role that experience plays in the learning process, “the process whereby knowledge is created through the transformation of experience” (Kolb, 2015, p. 49). John Dewey, a U.S. philosopher termed experiential

learning as an educational philosophy called the theory of experience (Dewey, 1938). Dewey positioned his argument on the fact that traditional education had little need for theory since the practice was already determined by tradition; therefore, the new experiential approach to education needed a sound theory of experience to guide its conduct. Experiential learning embraces an involvement in specific experiences, reflecting on them, intellectualizing those experiences, and actively participating in experimenting with those experiences (Kolb, 2015).

In the experiential learning theory, Kolb (2015) describes that learners' prior knowledge and perceptions about the learning activities impact how they interpret their current experiences. If a learner has a specific experience with a learning activity, it provides a basis for their learning. The learner then looks at this experience, observes it, reflects on it, and responds to it. These observations are integrated into a theoretical framework that relates to other ideas in their previous experience and knowledge about the learning activity. Kolb states that mere perception of experience alone is not enough to affect learning; it is rather that something must be accomplished with that experience; work must be done on a given project with which the learner has prior knowledge. In the same instance, Kolb indicates that the transformation of experiences only cannot signify learning; there must be something to be transformed, some state or experience that is being acted upon. Kolb confers that learning occurs when a concrete experience is expanded with reflection and observation, formed on abstract concepts and generalizations, and tested in new situations. In experiential learning theory, Kolb (2015) further asserts that learning is a process rather than an outcome. Learners learn and re-learn from their experience with hands-on activities resulting in mastery of concepts through assimilation and accommodation processes. In these processes, learning outcomes are a representation of historical records that are gained from the experience while performing the activities.

The praxis of experiential learning requires a reflection stage to provide a starting point for Kolb's experiential learning cycle, without necessarily beginning with the experience itself (Jones & Bjelland, 2004). The experiential learning cycle requires a cognizant assessment of the learners' pre-existing perceptions, attitudes, and/or biases that are likely to impact the whole learning process. Students who participate in the service-learning program in Uganda are oriented on how project activities are implemented through school gardens in elementary schools (Nonnecke et al., 2015). These orientations provide an overview of the school gardens and related program activities, whom students will work with, and how activities are implemented before the start of their service-learning experiences which influences their eagerness to participate in the programs and subsequent learning.

Purpose and Objectives of the Study

The number of study abroad programs increased over the past three decades from 1990 to 2019, before the COVID-19 global pandemic that restricted travel (Opendoors, 2023). With the increase, HEIs saw an increase in the importance of efforts in assessment and accountability (Bringle & Hatcher, 2011). This study aligns with the second goal of the U.S. national agricultural education research agenda of 2016-2020. The goal focuses on "What evaluation methods, models, and practices are effective in determining the impacts of educational programs in agriculture and natural resources?" (Thoron et al., 2016, p. 41). The most popular academic program assessments are the surveys conducted among alumni (Miller et al., 1998). The primary purpose of this study was to determine how influential the activities of a service-learning program were to the academic development of university alumni. The purpose was achieved through four specific objectives that included to:

1. Identify the differences in academic progress made by service-learning alumni to their demographic characteristics.
2. Determine which service-learning activities were most influential to the academic development of service-learning alumni.
3. Identify the level of influence of service-learning activities on the academic development of service-learning alumni.

4. Determine if there were any differences in the level of influence of service-learning activities on the academic development of Makerere University and Iowa State University service-learning alumni.

Methodology

This study was part of a larger census study that investigated the impact of a service-learning program in Uganda on the academic, professional skills, and intercultural competence development of the service-learning alumni. Approval to conduct this study was sought from the Institutional Review Board (IRB) at ISU, which was determined as “Exempt” under IRB number 21-263-01. The study utilized an electronic (e-mail) communication and survey system through Qualtrics to collect data in the period starting from February 7 through March 10, 2022. Qualtrics was used because it would collect large amounts of data from a dispersed population like the Uganda service-learning alumni who live in and outside the U.S.; and ensured confidentiality, an aspect that helps to gather more truthful and honest responses; and increases the speed of obtaining results (Ary et al., 2018; Dillman et al., 2014).

The population for this study consisted of 291 (i.e., 166 of MAK and 125 of ISU) service-learning alumni. The alumni represented all university student participants who completed the summer semester, service-learning program named, *Creating a School Garden: Service-learning in Uganda*, held in the Kamuli district, Uganda between 2006 through 2019. This service-learning program was completed as part of the education efforts of ISU’s College of Agriculture and Life Sciences and CSRL to use the power of education to transform communities and to develop the next generation of future responsible citizens. The alumni were identified from the program’s database through the Associate Director, Education Programs of CSRL. Email addresses were updated by the investigators before the beginning of the survey.

Instrumentation

The design of the questionnaire followed the guidelines of Dillman et al. (2014) using a Tailored Design Method (TDM) of customization of the survey mode to reduce errors, adopt multiple contacts, and focus the content on the study goal to induce a positive social exchange. In a total of eight questions, the instrument captured all data for each objective of this study using dichotomous and scale questions. In the introductory section, the dichotomous questions sought to identify alumni’s university during service-learning, year of participation, and year of study. The main section contained a scale question on the service-learning activities’ influence on alumni’s academic development. The question used a set of six-point Likert-type scale questions with 12 Likert items (i.e., service-learning activities) measuring alumni’s agreement with the level of influence on how the activity influenced their academic development. The scale was composed of “0=Did not participate; 1=Not at all influential” through “5=Extremely influential.” The option for “Did not Participate” was added since not all alumni completed all activities across the years because new activities were implemented with continuous program assessment (Nonnecke et al., 2015) and in later years with the development of a training center facility in Kamuli district with student residence. Alumni who did not participate in an activity were excluded from the final analysis of that respective activity. The additional background information captured gender, the house of residence in the Kamuli district during service-learning, current education status, and the place where alumni grew up in their home countries.

Establishment of reliability for consistent results

In the design of the survey instrument for the study, systematic and rigorous steps were followed to ensure that the final survey instrument was valid and once deployed, ensured data collected were consistent with the study objectives. The instrument was reviewed by a team of 12 members with different experiences, specialties in higher education, global service-learning, and research methods. These included five professors from the U.S., two from Ugandan universities, and five doctoral students based in the U.S.

(i.e., two of U.S. origin and three African). The systematic review followed the authors' designed panel of expert guidelines aimed at identifying whether each item in the instrument was: i) relevant to the objective of the study, ii) clear and concise, iii) not multi-barreled, and iv) free of technical jargon. Each item in the evaluation tool had a comment section and in general, final comments were submitted together with a summary indicating whether content, construct, and face validity, should be: i) retained as is, ii) modified and retained, and iii) deleted for each item in the survey instrument. All items were modified as needed and retained.

Data collection

Following Dillman et al. (2014) TDM, an invitation letter was sent on February 7, 2022, to all 291 alumni in a single e-mail using a "blind carbon copy" feature to protect the privacy of alumni emails while informing them about the upcoming survey. The letter stated the purpose and the importance of their participation. Of 291 alumni, 17 had failure delivery emails. Efforts to trace the 17 alumni were not successful and 274 alumni were included for the remainder of the survey. Within three days, on February 9, the initial link was sent through Qualtrics to 274 alumni with a cover letter explaining the research purpose, confidentiality, a request for timely response, and thanking them for their voluntary willingness to participate in the study. Consent was embedded in the first question where alumni who chose to participate, clicked "yes" and continued; those who chose not to participate, clicked "no" and the survey ended with a thank you note. All sections were marked, and directions were provided on each section and question. A total of $n = 150$ (54.8%) of the total alumni (274) completed the survey in the initial invitation.

A follow-up letter is an effective way to increase the return rate (Dillman et al., 2014), and after 10 days on February 18, a follow-up letter was sent to 124 alumni through email to remind them about the survey sent earlier and that their responses were important. To deal with late respondents another follow-up letter with the survey link was sent to 72 alumni on February 28 three weeks after the original survey to stimulate the response returns. On March 7, a final reminder was sent to 32 alumni who had not completed the survey. Data collection lasted for 30 days and was closed on March 10, 2022, with an overall response rate of 94.2% ($n = 258$) of 274 total alumni; MAK at 95.6% ($n = 151$) of 158 MAK alumni; and ISU at 92.2% ($n = 107$) of 116 ISU alumni. The usable responses were 92.0% ($n = 252$) of 274 total alumni: MAK with 94.3% and ISU with 88.8%.

After data collection, the 12 Likert-scale responses about service-learning activities were subjected to reliability analysis using Cronbach's alpha. The recommended alpha value is 0.70, indicating that 70% of the variance in the score is reliable and 30% is error variance (Taber, 2018). Cronbach's alpha analysis takes the composite score rather than an individual score as a measure of internal reliability before a robust analysis can be performed (Bolarinwa, 2015). In this study, the alpha value on activities was 0.893 which shows a strong internal consistency for the 12 service-learning activities surveyed with 179 (71.0%) usable responses.

Data analysis

Data were exported from Qualtrics to Excel for cleaning and reorganization of variables, after which were transferred to IBM-SPSS 28 statistical software for analysis. For objective one on the academic progress of the alumni after service-learning, a bivariate analysis using Chi-square at a 0.05 level of significance was used to determine the overall academic progress to their demographic characteristics and presented as percentages in a tabular form. A Principal Components Analysis (PCA), an exploratory multivariate statistical tool based on variance maximizing rotation [Varimax] (Everitt & Dunn, 2001; Kaiser, 1960), was used for objective two to determine the service-learning activities that most influenced the academic development of the alumni during service-learning. The PCA tool extracted a few components that efficiently showed commonality between service-learning activities and their influence on the academic development of the alumni. The component categorization was based on the criteria set by Kaiser (1960) where only activities with an Eigenvalue greater than one were considered significant for analysis.

The results are presented in a tabular form showing the factor loadings for the final rotated components, the extracted commonalities, and the overall Kaiser-Meyer-Olkin (KMO) and Bartlett's test measure of sampling adequacy. To improve clarity, all factors with less than 0.5 loadings were excluded from the table.

For objective three, descriptive statistics on each service-learning activity were used to determine the frequencies and percentages of alumni who perceived an activity was "not at all influential" through "extremely influential" to their academic development. The fourth objective to determine any differences between MAK and ISU alumni regarding activities that most influenced their academic development used an independent sample *t*-test, which was based on the composite sum of the Likert scales on service-learning activities to determine the overall significance of differences. Individual activities were also analyzed using an independent sample *t*-test to determine which alumni group had a significant difference from the other. The results are presented in a tabular form showing a comparison between MAK and ISU alumni. The comparison was based on their mean (*M*) and standard deviation (*SD*); overall *t*-statistic (*t*), *p*-value at 0.05, and Cohen's (*d*) to measure the effect size of any statistically significant differences in the means between MAK and ISU service-learning alumni groups.

Findings

The first objective sought to determine the academic progress of the alumni after service-learning, whether students completed their baccalaureate degree and/or enrolled in graduate school for master's and/or doctoral programs. A bivariate analysis using Chi-square was used to determine the academic progress in relation to the alumni's demographic characteristics during their service-learning period. The characteristics included university attended, year of participation, year of study, gender, and residential home where they grew up. Overall, of the 252 alumni, 124 (49.2%) had baccalaureate degrees (47.6% completed and 1.6% still enrolled); 89 (35.3%) engaged in master programs (15.9% completed and 19.4% still enrolled), and 39 (15.5%) engaged in doctoral programs (7.9% completed and 7.5% still enrolled), at the time of completion of the survey on March 10, 2022. The majority of the alumni 128 (50.8%) were in or had attended graduate school for their master's and/or doctoral programs. Table 2 presents the percentage relationship between alumni's academic degrees and their demographics.

Table 2

Number and Percentage of Alumni Enrolled in or Completed an Academic Degree for Various Demographic Characteristics of Service-Learning Alumni from MAK and ISU.

Demographic Characteristics of the Alumni	Degrees Enrolled and/or Completed as Combined**				<i>P</i> -Value
	Bachelors <i>f</i> (%)	Masters <i>f</i> (%)	Doctorates <i>f</i> (%)	Total <i>f</i> (%)	
<i>University</i>					
ISU	45 (36.3)	44 (49.4)	14 (35.9)	103 (40.9)	.124
MAK	79 (63.7)	45 (50.6)	25 (64.1)	149 (59.1)	
<i>Year of Participation</i>					
2006-2010	14 (11.3)	21 (23.6)	18 (46.2)	53 (21.0)	<.001
2011-2015	44 (35.5)	41 (46.1)	16 (41.0)	101 (40.1)	
2016-2019	66 (53.2)	27 (30.3)	05 (12.8)	98 (38.9)	
<i>Year of Study</i>					
Freshmen	07 (5.6)	08 (9.0)	01 (2.6)	16 (6.3)	.030
Sophomore	73 (58.9)	46 (51.7)	15 (38.5)	134 (53.2)	
Junior	42 (33.9)	27 (30.3)	19 (48.7)	88 (34.9)	
Senior	02 (1.6)	08 (9.0)	04 (10.3)	14 (5.6)	

<i>Gender</i>					
Male	53 (42.7)	36 (40.4)	22 (56.4)	111 (44.0)	.225
Female	70 (56.5)	53 (59.6)	16 (41.0)	139 (55.2)	
No Answer	01 (0.8)	00 (0.0)	01 (2.6)	02 (0.8)	
<i>Residential Home</i>					
Urban	35 (28.2)	33 (37.1)	18 (46.2)	86 (34.1)	.275
Semi-urban	41 (33.1)	28 (31.5)	09 (23.1)	78 (31.0)	
Rural	48 (38.7)	28 (31.5)	12 (30.8)	88 (34.9)	

**If enrolled in or completed masters' degrees, service-learning program alumni were not included in the number or percentage of alumni in bachelor-degree programs; if enrolled in or completed doctoral degrees, alumni were not included in bachelor's or master's degree data.

Statistically, the year of participation in service-learning correlated with alumni's academic enrollment or completion of degrees; where the alumni in the cohort of 2006-2010 had a higher likelihood of having progressed to doctoral programs, whereas those of 2011-2015 were more likely to have enrolled or obtained masters' degrees. There was growth in the number of alumni seeking graduate education from the 2016-2019 cohort. Of the alumni who participated as sophomores during service-learning, they had a higher likelihood of enrolling for masters' degrees, and juniors were likely to enroll or continue with doctoral programs.

Influence of service-learning activities on the academic development of the alumni

For objective two, alumni participated in 12 major activities in the service-learning program in Uganda, which had different levels of influence on their academic development during their service-learning experience. The Principal Components Analysis (PCA) generated three components (Table 3) in a Varimax converged in five alterations for all 12 service-learning activities. Overall, with MAK-ISU combined, the cumulative rotation sums of squared loadings (CRSSL) were 66.4% with component one accounting for the largest proportion (46.4%); and 10.5 and 9.5 percent for components two and three respectively.

Table 3

Factor Loadings for Final Rotated Component Matrix Showing the Commonalities Among the Service-Learning Activities That Influenced the Academic Development of MAK and ISU Alumni.

Service-learning Activities Alumni Participated in	MAK-ISU Combined Components Loading			ISU Only Components Loading			MAK Only Components Loading		
	1	2	3	1	2	3	1	2	3
	School gardening	0.855			0.881			0.826	
Bi-national projects	0.752			0.688			0.781		
Arrival orientations	0.656			0.670			0.684		
Farmer field visits	0.621			0.577			0.660		
School teaching	0.555			0.614			0.446		
Journaling/logbook		0.844			0.845				0.754
Critical reflections		0.833			0.847				0.793
Presentations		0.800			0.767				0.764
Pre-departures		0.473		0.535				0.600	
Co-curriculars			0.815			0.815		0.697	

Tours and travels	0.801	0.828	0.855
Social parties	0.752	0.798	0.670

MAK-ISU KMO and Bartlett's test = .869; $\chi^2 = 1012.287$; $df = 66$; and $p = <.001$.

MAK Only KMO and Bartlett's test = .819; $\chi^2 = 467.878$; $df = 66$; and $p = <.001$.

ISU Only KMO and Bartlett's test = .838; $\chi^2 = 469.686$; $df = 66$; and $p = <.001$.

Numbers 1, 2, and 3 means principal components that were generated from the analysis.

The three components included 1) community engagement and reciprocity, 2) cognitive development, and 3) socialization. A total of five activities were loaded on component one, which showed a higher commonality in influencing the academic development of the alumni during their service-learning experience. School gardening and bi-national team projects had the highest factor loading followed by arrival orientations, farmer field visits, and school teaching. Component two had four factors that showed similarity in their influence on the academic development of alumni. The factor loadings among which three including journaling and logbooks, critical reflections, and presentations had higher loading, compared to pre-departure orientation which had a .473 factor loading, lower than the 0.5 set criteria for inclusion in the analysis (Kaiser, 1960). The third component had three factors that loaded together depicting commonality in influencing alumni academic development including co-curricular activities and tours and travel with higher loadings as compared to social parties.

From the analysis of individual universities, ISU had a CRSSL of 66.8% with components one, two, and three accounting for 45.6, 10.8, and 10.4 percent respectively, whereas MAK had a CRSSL of 62.6% with components one, two, and three accounting for 41.5, 11.4, and 9.7 percent respectively. Component one, which loaded school gardening, binational team projects, arrival orientations, farmer field visits, and school teaching, loaded in a similar order across all three PCA analyses – MAK-ISU, MAK only, and ISU only (Table 3) showing a common influence towards the academic development of the alumni. School teaching exhibited a weaker loading in component one for MAK only but strongly loaded for MAK-ISU and ISU only. Pre-departure orientations loaded strongly in component one for ISU only; in MAK only and MAK-ISU, it loaded strongly with the former and weaker with the latter. For components two and three, MAK-ISU, and ISU only, similar factors of journaling and logbooks, critical reflections, and presentations loaded on component two; and co-curricular activities, tours and travels, and social parties loaded on component three. However, MAK only exhibited a reversed loading where factors that loaded on components two and three for MAK-ISU and ISU only loaded on components three and two respectively for ISU only, all influencing the academic development of the alumni during their service-learning experience in Uganda.

Level of influence of service-learning activities on the academic development of the service-learning alumni

To address objective three, the descriptive results (Table 4) revealed that four of the 12 service-learning activities, including farmer field visits, binational team projects, tours and travels, and journal and logbook writing were “extremely influential” to the academic development of the alumni during their service-learning period. The remaining eight activities including school gardening, school teaching, presentations, critical reflections, social parties, arrival orientations, co-curricular activities, and pre-departure orientations had a higher proportion of alumni perceiving them as “very influential” to their academic development.

Table 4

Number and Percentage Level of Influence of Service-Learning Activities on the Academic Development of the MAK and ISU Alumni During Their Service-Learning in Uganda.

Major Uganda Service-Learning Activities	<i>n</i>	Not At All Influential <i>f</i> (%)	Slightly Influential <i>f</i> (%)	Somewhat Influential <i>f</i> (%)	Very Influential <i>f</i> (%)	Extremely Influential <i>f</i> (%)
<i>Farmer Field Visits</i>						
ISU	97	-	06 (6.2)	15 (15.5)	33 (34.0)	43 (44.3)
MAK	144	01 (0.7)	03 (2.1)	10 (06.9)	46 (31.9)	84 (58.3)
Overall	241	01 (0.4)	09 (3.7)	25 (10.4)	79 (32.8)	127 (52.7)
<i>Bi-National Projects</i>						
ISU	97	-	09 (9.3)	11 (11.3)	28 (28.9)	49 (50.5)
MAK	141	02 (1.4)	04 (2.8)	16 (11.3)	53 (37.6)	66 (46.8)
Overall	238	02 (0.8)	13 (5.5)	27 (11.3)	81 (34.0)	115 (48.3)
<i>School Gardening</i>						
ISU	102	01 (1.0)	08 (7.8)	18 (17.6)	42 (41.2)	33 (32.4)
MAK	145	02 (1.4)	06 (4.1)	8 (5.5)	62 (42.8)	67 (46.2)
Overall	247	03 (1.2)	14 (5.7)	26 (10.5)	104 (42.1)	100 (40.5)
<i>Tours and Travels</i>						
ISU	101	04 (4.0)	13 (12.9)	28 (27.7)	30 (29.7)	26 (25.7)
MAK	126	07 (5.6)	10 (07.9)	19 (15.1)	39 (31.0)	51 (40.5)
Overall	227	11 (4.8)	23 (10.1)	47 (20.7)	69 (30.4)	77 (33.9)
<i>School Teaching</i>						
ISU	101	02 (2.0)	11 (10.9)	25 (24.8)	38 (37.6)	25 (24.8)
MAK	133	06 (4.5)	06 (04.5)	19 (14.3)	51 (38.3)	51 (38.3)
Overall	234	08 (3.4)	17 (7.3)	44 (18.8)	89 (38.0)	76 (32.5)
<i>Journaling and Logbooks</i>						
ISU	98	10 (10.2)	17 (17.3)	35 (35.7)	22 (22.4)	14 (14.3)
MAK	141	02 (1.4)	07 (05.0)	21 (14.9)	50 (35.5)	61 (43.3)
Overall	239	12 (5.0)	24 (10.0)	56 (23.4)	72 (30.1)	75 (31.4)
<i>Presentations</i>						
ISU	101	05 (5.0)	23 (22.8)	26 (25.7)	25 (34.7)	12 (11.9)
MAK	141	01 (0.7)	02 (01.4)	15 (10.6)	59 (41.8)	64 (45.4)
Overall	242	06 (2.5)	25 (10.3)	41 (16.9)	94 (38.8)	76 (31.4)
<i>Critical Reflections</i>						
ISU	101	04 (4.0)	11 (10.9)	28 (27.7)	31 (30.7)	27 (26.7)
MAK	141	02 (1.4)	07 (05.0)	21 (14.9)	63 (44.7)	48 (34.0)
Overall	242	06 (2.5)	18 (07.4)	49 (20.2)	94 (38.8)	75 (31.0)
<i>Social Parties</i>						
ISU	92	06 (6.5)	10 (10.9)	25 (27.2)	28 (30.4)	23 (25.0)
MAK	134	08 (6.0)	12 (09.0)	24 (17.9)	45 (33.6)	45 (33.6)
Overall	226	14 (6.2)	22 (09.7)	49 (21.7)	73 (32.3)	68 (30.1)
<i>Arrival Orientations</i>						
ISU	100	02 (2.0)	11 (11.0)	35 (35.0)	17 (17.0)	17 (17.0)
MAK	146	04 (2.7)	07 (04.8)	15 (10.3)	70 (47.9)	50 (34.2)
Overall	246	06 (2.4)	18 (07.3)	50 (20.3)	105 (42.7)	67 (27.2)
<i>Co-curriculars</i>						
ISU	100	05 (5.0)	12 (12.0)	30 (30.0)	28 (28.0)	25 (25.0)
MAK	140	06 (4.3)	17 (12.1)	28 (20.0)	51 (36.4)	38 (27.1)

Overall	240	11 (4.6)	29 (12.1)	58 (24.2)	79 (32.9)	63 (26.3)
<i>Pre-departure Orientations</i>						
ISU	99	01 (1.0)	17 (17.2)	41 (41.4)	28 (28.3)	12 (12.1)
MAK	145	05 (3.4)	04 (02.8)	26 (17.9)	70 (48.3)	40 (27.6)
Overall	244	06 (2.5)	21 (08.6)	67 (27.5)	98 (40.2)	52 (21.3)

Differences in the level of influence of service-learning activities on the academic development of the service-learning alumni

Objective four determined if any differences existed between Makerere University (MAK) and Iowa State University (ISU) alumni on how service-learning activities influenced their academic development during service-learning. The combined complete responses were 179 (MAK = 97, ISU = 82) and results indicated that service-learning activities had a higher influence on the academic development of MAK alumni ($M = 4.18$, $SD = .563$) than they did for ISU alumni ($M = 3.65$, $SD = .715$); $t(152.756) = 5.415$, $p = .011$, Cohen's $d = .82$ (large effect size). For individual service-learning activities (Table 5), four of the 12 activities including presentations, journaling and logbook writing, arrival orientation in Kamuli district, and critical reflections had statistically significant higher means for MAK than for ISU alumni with varying effect sizes on mean variations from small to very large.

Table 5

Mean Differences in Influence of Service-Learning Activities on Academic Development of MAK and ISU Service-Learning Alumni.

Uganda Service-learning Activities	MAK			ISU			Statistic		
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>p</i>	<i>t</i>	<i>d</i>
Farmer field visits	144	4.45	.774	97	4.16	.909	.106	2.624	
Presentations	141	4.30	.772	101	3.26	1.092	<.001	8.683	1.10 ^{VL}
School gardening	145	4.28	.856	102	3.96	.954	.578	2.777	
Bi-national projects	141	4.26	.873	97	4.21	.978	.139	.406	
Journaling/logbooks	141	4.14	.946	98	3.13	1.172	.033	7.348	.95 ^L
Arrival orientations	146	4.06	.941	100	3.54	.968	.030	4.220	.55 ^M
Critical reflections	141	4.05	.905	101	3.65	1.108	<.001	3.055	.40 ^S
School teaching	133	4.02	1.059	101	3.72	1.021	.336	2.124	
Pre-departures	145	3.94	.937	99	3.33	.937	.093	4.949	
Tours and travels	126	3.93	1.174	101	3.60	1.123	.637	2.110	
Social parties	134	3.80	1.175	92	3.57	1.70	.662	1.469	
Co-curriculars	140	3.70	1.123	100	3.56	1.140	.604	.946	

Cohen's (d)=Effect Size at ^S=Small, ^M=Medium, ^L=Large, ^{VL}=Very Large.

Scale on Academic Development: "1=Not at all Influential" through "5=Extremely Influential"

Discussion of the Findings

In the first objective, the study sought to identify the differences in academic progress made by alumni based on their demographics. Most alumni were found to have completed their bachelor's degree programs after service-learning and had enrolled and/or completed graduate school for master's and/or

doctoral programs. The influence of time (i.e., early participants of 2006-2010) significantly accounted for a higher number of alumni who were in or had completed graduate school, which is logical as the passage of time would be expected to influence the number of alumni with advanced degrees. Others found that service-learning programs increase academic retention and graduation rates (Bringle et al., 2010; Lockeman & Pelco, 2013). Similarly, service-learning has a multiplier effect on those students who participate in these programs, as they have a high propensity to continue with their college education, advancing from lower levels to higher levels persistently and expressing higher satisfaction ranking for their college education than their counterparts who do not participate (Bringle et al., 2010; Kuh et al., 2008; Lockeman & Pelco, 2013; Luo & Jamieson-Drake, 2015).

In the second objective, we sought to determine what service-learning activities most influenced alumni's academic development during service-learning. A principal components analysis was employed. We found three aspects including: 1) community engagement and reciprocity, 2) cognitive development, and 3) socialization and their related activities of the service-learning program that added to the academic development of the alumni. The first aspect of community engagement and reciprocity showed commonality among five service-learning activities including school gardening, bi-national team projects, arrival orientations, farmer field visits, and school teaching. These activities depicted a deeper engagement of service-learners in the field working with communities during their learning activities. These activities included students immersed in the communities while implementing service-learning projects, which promoted reciprocal learning, an interface that describes students learning from the communities and communities learning from students.

Arrival orientations in Kamuli, Uganda during the summers helped to build on the pre-departure orientations conducted in the Spring semesters, providing a connection between the experience and learning from the activity itself (Jones & Bjelland, 2004). The orientations helped students prepare for programmed activities as they met with selected farmers, school officials, and host organization extension and outreach coordinators. Arrival orientations created pathways and fostered bonding among students, their facilitators, and the target communities. The school gardening program provided learning platforms for students and pupils to practice the principles learned in classrooms including land use planning, nursery and seedbed management for various vegetables and food crops students grow, and agroforestry and orchards. These hands-on experiences from school gardens and related activities improve students' knowledge acquisition leading to the development of the whole child as espoused in Dewey's school garden approach (Dewey, 1918; Ralston, 2011). These experiences are what situated cognition theory advocates – linking teaching to a specific activity or social situation to enhance the learning process because of learners' familiarity with that situation (Brown et al., 1989; Lave & Wenger, 1991; Robbins & Aydede, 2008). Relatedly, in assisting in the teaching subjects, like science, agriculture, English, and mathematics, students are prepared as future educators. Teaching assistance fits into a direct support service model which describes a relationship between service-learning and extension where service-learners are directly involved in assisting programs to deliver services to communities (Stoecker, 2014).

Bi-national team projects help to address challenges faced by schools and communities in food and nutrition security, public health, and postharvest handling of food. For instance, in postharvest projects of the CSRL/ISU-UP adopted a pedal-operated grain cleaner for its schools and communities, which was the work of service-learning alumni with support from faculty at MAK and ISU in its design and fabrication (Mayanja et al., 2018). Overall, bi-national team projects were found to promote deep learning through students' engagement in research, problem-solving, leadership, teamwork, and the development of intercultural competence (Ikendi et al., 2022; Kugonza et al., 2015; Nonnecke et al., 2015; 2018). Farmer field visits provided alumni with the opportunity to be immersed in communities, working with farmers, their facilitators, and extension and outreach agents to accomplish farm field activities. This is the reciprocity in service-learning which promotes the co-creation of knowledge through interacting with farmers and seeking insights into the facts, reasons, beliefs, and rationale underlying their various

agricultural practices. These interactions foster community empowerment, a major role of the philosophical role of education in the creation of better communities through a problem-solving approach to learning (Dewey, 1938; Freire, 1970).

The second aspect of service-learning that added to alumni's academic development was cognitive development which loaded activities of journal and logbook writing, critical reflections, and presentations that depicted the reflexive actions of the alumni on their fieldwork activities. These reflexive activities provided for the cognitive development of the alumni while documenting and confronting their assumptions and perceptions about the learning activities through rigorous critical thinking and sharing of their learned lessons. During service-learning, these activities helped alumni to gain and share their insights into how the activities were completed, what lessons were learned, and what would have been learned if the project activities had been implemented differently. The activities also demonstrated how projects could be implemented to ensure continuity and sustainability after their summer service-learning period, by working with pupils in school gardens, school clubs, and related projects while building their capacity to manage the projects (Ikendi, 2022; Kugonza et al., 2015; Nonnecke et al., 2015).

The critical reflection activities demonstrate students' deep learning (Hahn & Hatcher, 2015), critical thinking, and overall academic learning (Ash & Clayton, 2009; Molee et al., 2010; Sturgill & Motley, 2014). Critical reflections further foster critical reasoning and social trust, an element that is vital in academic success and improves cognitive empathy, moral reasoning, and overall professional development of the learners (Mitchell et al., 2015). These benefits persist with students after college which fosters lifelong learning and good global citizens. Journals and logbooks on the other hand helped students keep track of activities; how they were performed, when, where, and with whom. These journals and logbooks were routinely graded by the student's supervisors to assess the learning progress and provide feedback to students on how to link field activities to learning objectives. Journals and logbooks formed a learning portfolio that guided students in writing reports, reflections, and presentations which demonstrated their contribution to community development and enhance their resumes for employability (Chapman, 2018). The presentations promoted teamwork and social identity centered on belongingness to a larger presentation group through group photos taken during presentation seminars in Kamuli and/or at Makerere University and shared on their social media platforms (Ikendi et al., 2022).

The third aspect of service-learning that contributed to alumni's academic development was socialization which loaded co-curricular activities, tours and travels, and social parties. These activities depicted alumni's social life through travel and leisure during service-learning. Social activities reduced alumni fatigue after routine fieldwork and provided opportunities for alumni to learn about peers' cultural distinctiveness beyond field activities. In tours and travels, service-learning students saw and learned about Uganda's tropical vegetation and diverse wildlife and provided a tourist opportunity to further enrich their cultural understanding (Jarvis & Peel, 2008; Nawijn et al., 2010). The co-curricular activities, such as sports and games while at the elementary schools provided opportunities for relaxation, deeper engagement, and the development of personal understanding of peers, pupils, and facilitators. Interactions among the students in these co-curricular activities lead to a better understanding of peers' cultural distinctiveness, which improves the authenticity of intergroup contact relations and promotes intercultural competence development. Social parties like celebrating U.S. Independence Day on the 4th of July and sharing traditional foods increased service-learning alumni knowledge of the culture of both the U.S. and Uganda.

Pre-departure orientations loaded well on the first principal component for ISU alumni who were visitors to Uganda and similar to many U.S. students might experience culture shock upon their arrival, during, and post-experience. Allowing students to participate in intentionally planned orientations before the actual learning experience provides them with an opportunity to identify and examine preconceived conceptions and attitudes they might have before the learning experience which induces their learning (Gouldthorpe et al., 2012; Harder et al., 2012; Jones & Bjelland, 2004). Students become informed about

planned activities and how they will be accomplished, the time frame, people to be involved, any precautions, health issues, travel arrangements, and how faculty evaluations of their work will be conducted. These orientations require experts who are aware of the host country. Experts can design relevant activities aimed at building group cohesion and addressing students' safety and health concerns, thereby reducing anxiety among students (Salyers et al., 2015). All these activities characterize the pre-departure orientations of the service-learning program in Uganda, where both faculty and staff from MAK and ISU, ISU-UP staff, service-learning alumni, healthcare providers, and cultural leaders in Uganda are involved in orientations that break the fear of the unknown.

Related to objectives three and four in the determination of any differences between MAK and ISU alumni in service-learning activities that most influenced their academic development, results revealed that MAK alumni had a higher overall mean as compared to ISU alumni. Significantly four of the 12 service-learning activities including presentations, arrival orientations, journaling and logbooks, and critical reflections showed significantly higher means for MAK alumni than ISU alumni in their influence on academic development. The probable explanation could be related to the length of the service-learning program where MAK alumni had ten weeks and ISU alumni had six weeks (Nonnecke et al., 2015). This timing meant there was more time for the MAK alumni to work on different activities and be engaged within schools and communities, which increased their academic learning. Similarly, MAK alumni enjoyed the native Ugandan advantage where they easily bonded with communities and schools during service-learning as compared to ISU alumni who were visitors.

Conclusions, Implications, and Recommendations

This census study involved 94.2% of 274 alumni of the summer service-learning program named "*Creating a School Garden: Service-learning in Uganda*" from 2006-2019, who participated as undergraduate university students. The study assessed the influence of service-learning activities on the academic development of the alumni during their service-learning experience. A bi-national service-learning program can have an impact on participants' academic development based on feedback from alumni of the program. These findings have implications for delivering global service-learning and undergraduate programs. There is richness and value to both students from the visiting and host country, and planned activities should intentionally and deliberately develop multinational teams when possible. Planners should consider three types of activities to ensure a well-rounded experience occurs with a deep level of learning. Two of the three activities are in the service-learning name; students should have various opportunities to provide service and well-developed and intentional learning components should be included. The third activity is the social aspect where students engage in co-curricular activities, tours and travel, and social events.

Global service-learning programs should involve pre-departure orientations which help to address the biased thinking among students which could potentially prevent students from participating due to a lack of accurate information about the programs and activities. Conducting pre-departure orientation exercises with experienced program facilitators provides relevant information about potential experiences which increases students' eagerness to participate in service-learning activities. By including pre-departure orientations, students can compare their perceptions before and after participation in the study abroad program, increasing their learning. The pre-departure orientations can be regularly updated to improve the program for the next set of service-learners.

Based on the findings in the factor loadings, the cognitive development activities including critical reflections, journaling and logbooks, and presentations had consistently higher Eigen values demonstrating a strong commonality in influencing the academic development of the alumni. It is recommended that program facilitators allocate more time and attention to cognitive development activities during the service-learning period. These are technical activities that require students' guidance in writing and frequent

feedback from instructors for students to make meaning and question their participation in the field activities. The journaling and logbooks can be a form of reflection (reflexive writing) which is a critical component that distinguishes service-learning from other forms of service in the community like volunteerism and/or community service (Ash & Clayton, 2009; Sturgill & Motley, 2014). Students need support to turn reflective writing in their logbooks (MAK students) and journals (ISU students) into reflexive writing and signifies the depth of questioning their learning from the activities; critical thinking and reasoning on their assumptions; and rationale of their participation in service-learning activities to develop academically. Overall, cognitive development activities are critical in developing the reasoning capacity of the learners during oral presentations and public speaking skills, which skills persist with students after college, fostering lifelong learning.

Activities that promoted community engagement and reciprocity loaded on the first principle component in the analysis and demonstrated great strength in the academic development of the alumni. Farm field visits, for instance, were found to be among the most influential service-learning activities. However, this study did not establish how farmers are engaged in the programming of these farm field activities and what benefits accrue to their engagement with service-learning students. Additional studies could be conducted to assess how farmers and school teachers participate and benefit from the reciprocity of learning with university students and their facilitators on their farms and school garden projects respectively. The overarching question that could be asked here would be “How do we achieve reciprocity in global service-learning”? This kind of study would answer specific questions including: How have the host institutions promoted participatory planning of community service-learning activities? What benefits accrue to participating communities in service-learning programs? What are the roles of communities in the student-university-host institution-community learning triad during the service-learning period? The results of such a study would inform institutions implementing service-learning programs of the benefits and strategies of designing sustainable field activities that have mutual benefits to participants which also eases participatory implementation of programs and assessment of the service-learning outcomes.

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