

A Summer Agricultural Research Program Enlarges Community College Students' Perceptions of Agricultural Careers

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Abstract

This study examined the REACH program, a Research and Extension Experiences for Undergraduates (REEU) program, aimed at improving agricultural literacy and career development among community college students. This study employed a one-group pretest-posttest design using the *Perceptions of Agriculture and Agricultural Careers* questionnaire (quantitative) and participants' written responses to an open-ended question about agricultural career and academic plans (qualitative). Data were collected on the first and last day of the program to compare benchmarks to student achievement. The scaled responses were analyzed using the Wilcoxon signed-rank test, a nonparametric test. The open-ended responses were analyzed using content analysis. REACH Scholars developed more specific career plans and more favorable perceptions of personal job opportunities and their own capabilities in agriculture during the program. Regarding occupational requirements, the scholars' perception that many agricultural leaders had a college education significantly improved over the course of the REACH program. Despite these improvements, their views about agricultural occupations in general, including food processing, food inspection, forestry, and natural resources management, were not significantly different from pretest to posttest. This study demonstrated an effective evaluation strategy for evaluating undergraduate research programs in agriculture and the allied sciences. Recommendations include strategies for greater outcome evaluation of REEU programs.

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Introduction and Problem Statement

Community college is an empowering opportunity for many low-income, underrepresented, and marginalized populations (Denning, 2017; Weiss et al., 2019). Community college completion is an important issue for the individual student's financial future and the entire nation's economic vitality (Buchanan & Wilson, 2017). Many community college students face remedial instruction and financial concerns that may contribute to historically low retention and graduation rates among community colleges. The COVID-19 pandemic exacerbated these needs with community college enrollment declining as much as 9.4% in fall 2020 over the previous year. In comparison, enrollment among public four-year institutions declined 1.4% (National Student Clearinghouse, 2020; Sutton, 2021).

Unfortunately, many community college students need opportunities for access to colleges of agriculture to explore career pathways in food and agriculture, and a number of initiatives have been pursued to address this need, including summer agricultural courses at community colleges (Keith et al., 2010), spring admissions program at four-year institutions (Jones et al., 2021), and online baccalaureate degree programs for community college students with applied associate degrees (Williams et al., 2010).

To connect community college students to agriculture, we launched an 8-week, summer residential agricultural research program. The program, called REACH, was offered to students from Tennessee's 13 community colleges in 2018, 2019, and 2021. Thus, the purpose of this study was to understand perceptions of the REACH participants, known as REACH Scholars, toward food, agriculture, natural resources, and human sciences (FANHS) careers.

Theoretical and Conceptual Framework

The social-cognitive career theory (SCCT) developed by Lent, Brown, and Hackett (2002) undergirded this study. SCCT explains individuals' educational and career interests and the choices they make. Specifically, the ways that these interests and choices develop and change over time as well as how individuals parlay personal interests and choices into school and work competencies (Walsh et al., 2023). SCCT has been useful for describing contextual factors such as interests, social support, and academic performance that guide career development (Gysbers et al., 2013). The use of SCCT is of paramount importance in understanding career selection. Respectively, an individual expressing a primary interest or choice, taking action on this primary interest or choice, and experiencing successes and failures that influence "the shape of future career behavior" leads to career selection (Lent et al., 2002, p. 273).

SCCT establishes a tripartite, interactive model for understanding career selection. First, individuals explore their own self-efficacy by asking themselves if they have the aptitude for a certain career. Then, individuals consider the outcomes of deciding on a certain career such as educational requirements and salary. Finally, individuals appraise their own personal goals, ponder the relative importance of their different goals, and ask the question, "how much do I want to do this?" when making their career selection (Buthelezi et al., 2010; Lent et al., 1994).

The SCCT theory and research expounding on the theory have pointed to the need to provide career development programs for young adults to expand career options, build support, promote work satisfaction, and encourage goal setting (Wang et al., 2022). Importantly, Walsh et al. (2023) has called for greater attention to translational research whereby educational and career development programs are designed using SCCT.

Purpose

The overall purpose of this study was to understand perceptions of the REACH Scholars toward FANHS careers. The study was guided by two objectives:

1. Describe the REACH Scholars' perceptions of agriculture and agricultural careers both before and after the program.
2. Describe the REACH Scholars' perceptions of FANHS for their own career plans both before and after the program.

Methods

This study, part of a broader program evaluation of the REACH program (Donaldson et al., 2022), was designed as an outcome evaluation with the goal to describe results of the REACH program (Patton, 2015). This study was a one-group pretest-posttest design (Campbell & Stanley, 1963). The pretest and posttest instrument included both scaled responses and open-ended responses.

The REACH program, a USDA-funded Research and Extension Experiences for Undergraduates (REEU) program, aimed to help community college students explore FANHS careers and address the students' needs for undergraduate research, mentoring, and leadership development. The Tennessee community college system consists of 13 community colleges, and faculty and administrators at each community college recruited students through targeted and blanket announcements. To apply for the program, students submitted: (1) the application form, containing basic name and contact information; (2) their community college transcript; (3) a letter of recommendation from a community college faculty member; and (4) a signed letter of interest that summarized the student's qualifications, educational goals, and career goals. Selection considered all of the application materials and prioritized students with academic potential in chemistry, biology, engineering, and other STEM disciplines who were economically disadvantaged, racial/ethnic minorities, and first-generation college students. (Notably, chemistry and biology are required courses in FANHS baccalaureate degree programs.) REACH program applicants and selected scholars represented diverse academic majors including biology, chemistry, engineering, nursing, and pharmacy. No agricultural students applied for the REACH program.

Over three years, REACH engaged 23 students as research assistants with agricultural faculty at the University of Tennessee. Knoxville. Additionally, REACH Scholars participated in weekly workshops to develop workforce essential skills such as teamwork, career adaptability, and leadership to support FAS academic and career goals.

Study participants were REACH Scholars for 2018, 2019 and 2021. All participants signed consent forms for participation in the study. Of the 23 REACH participants, all agreed to participate in the study, although not every participant answered every item.

The pretest was completed on the first day of the REACH experience and the posttest was completed on the last day of the REACH experience in each respective year of the program. Both the pretest and posttest were administered using paper and pencil. Part one of the instrument used the *Perceptions of Agriculture and Agricultural Careers* questionnaire (Talbert & Larke, 1995a; 1995b). This instrument had 18 items used for this study with the following Likert scale: 1 (*strongly disagree*), 2 (*disagree*), 3 (*neither agree nor disagree*), 4 (*agree*), and 5 (*strongly agree*). A sample question was: "It takes people with special training to work in agriculture." Talbert and Larke (1995a) validated the instrument with Texas high school students, demonstrating three distinct scales, and Cronbach's alpha for each scale was reported as follows: personal career (0.80), agricultural occupations (0.85), and occupational requirements (0.73). The personal career scale had five items, the agricultural occupations scale had seven items, and the occupational requirements scale had six items. The scales had been used to measure perceptions of students (see Talbert, 1996; 1997; 1999). While the scales were validated with high school students, the questions were aligned with the REACH program goals and the limited agricultural academic experiences of the REACH participants who did not have any college-level agricultural coursework. Part two of the instrument asked for open-ended responses to this question: "How do you see the food, agricultural, natural resources, and human sciences incorporated into your career plans, if at all?"

In terms of data analysis, part one of the questionnaire was analyzed using the Wilcoxon signed-rank test, a nonparametric test. This test was employed as the data were positively skewed, and Wilcoxon signed-rank test is appropriate in comparing categorical data. Comparable to the paired-samples t-test, the Wilcoxon signed-rank test was used to compare the pre and posttest responses for the personal career, agricultural occupations, and occupational requirements scales (Talbert & Larke, 1995a). Significance was set a priori at the 0.05 alpha level. Part two data were analyzed using content analysis, recognized as reducing data to "identify core consistencies and meanings" (Patton, 2015, p. 541). Researchers compared pretest and posttest responses from each individual participant. The responses were coded, and the codes were analyzed for themes.

Findings

Objective 1: Describe the REACH Scholars' perceptions of agriculture and agricultural careers both before and after the program.

As previously stated, the following Likert scale was used: 1 (*strongly disagree*), 2 (*disagree*), 3 (*neither agree nor disagree*), 4 (*agree*), and 5 (*strongly agree*). To compare pretest and posttest responses for the personal career, agricultural occupations, and occupational requirements scales, Wilcoxon signed-rank tests were conducted. Positive ranks indicated that agreement increased over the course of the program (higher posttest scores than pretest scores). Negative

ranks indicated agreement decreased over the course of the program (lower posttest scores than pretest scores), and ties indicated pretest and posttest scores were equal.

For the personal career perceptions, two items showed significantly higher perceptions from pretest to posttest: “Agricultural industry has many job opportunities” ($Z = 2.06, p \leq 0.039$), and “I am capable of getting a good job in an agricultural occupation” ($Z = 2.15, p \leq 0.03$). See Table 1.

Table 1

REACH Scholars’ Personal Career Perceptions for Wilcoxon Signed-Rank Test Results

Item	N	Z	2-tailed
Agricultural industry has many job opportunities.	23	2.06	0.03*
Negative Ranks	2		
Positive Ranks	11		
Ties	10		
There are good paying jobs in agriculture.	23	1.66	0.09
Negative ranks	3		
Positive ranks	10		
Ties	10		
I am capable of getting a good job in an agricultural occupation.	23	2.15	0.03*
Negative ranks	4		
Positive ranks	12		
Ties	7		
Someday I would like to manage a business in agriculture.	23	-0.81	0.41
Negative ranks	7		
Positive ranks	4		
Ties	12		
Someday I would like to be the owner of an agricultural business, farm, or ranch.	23	0.16	0.86
Negative ranks	6		
Positive ranks	8		
Ties	9		

Note. Negative ranks indicate lower post scores than pre scores; positive ranks indicate higher post scores than pre scores; and ties indicate equal pre and post scores

* $p \leq .05$

For the agricultural occupations perceptions, no significant differences were found. In fact, five of the seven items had a greater number of ties in mean ranks indicating no change from pretest to posttest while two items had the same number of ties as positive ranks (Table 2).

Table 2*REACH Scholars' Agricultural Occupations Perceptions for Wilcoxon Signed-Rank Test Results*

Item	N	Z	2-tailed
Landscaping and floral design are a part of agricultural industry.	22	1.12	0.26
Negative ranks	4		
Positive ranks	9		
Ties	9		
Agriculture includes marketing, merchandising, and sales of agricultural products.	23	1.21	0.22
Negative ranks	5		
Positive ranks	9		
Ties	9		
There are agricultural job opportunities in education, communication, and information.	23	0.51	0.60
Negative ranks	3		
Positive ranks	5		
Ties	15		
Many researchers and scientists are involved in the agricultural industry.	23	0.23	0.81
Negative ranks	5		
Positive ranks	6		
Ties	12		
Agriculture includes the design of farm machinery.	23	1.23	0.21
Negative ranks	4		
Positive ranks	7		
Ties	12		
Food processing and food inspection are part of the agricultural industry.	23	1.26	0.20
Negative ranks	1		
Positive ranks	6		
Ties	16		
Forestry and natural resource management are a part of agriculture.	23	0.64	0.51
Negative ranks	2		
Positive ranks	4		
Ties	17		

Note. Negative ranks indicate lower post scores than pre scores; positive ranks indicate higher post scores than pre scores; and ties indicate equal pre and post scores.

For the occupational requirements perceptions, most of the items demonstrated ties in mean rank with no significance in the difference between positive and negative ranks. One item,

“Many leaders in agriculture have a college education” showed significantly more positive ranks, indicating a positive change in perceptions from pretest to posttest ($Z = 2.94, p \leq 0.00$). See Table 3.

Table 3

REACH Scholars’ Occupational Requirements for Wilcoxon Signed-Rank Test Results

Item	N	Z	2-tailed
Management positions in agriculture require training or experience.	23	1.18	0.23
Negative ranks	3		
Positive ranks	8		
Ties	12		
It takes people with special training to work in agriculture.	23	-0.29	0.76
Negative ranks	7		
Positive ranks	8		
Ties	8		
Agricultural jobs require basic skills such as reading, writing, or arithmetic.	22	-0.06	0.95
Negative ranks	4		
Positive ranks	5		
Ties	13		
Many leaders in agriculture have a college education.	23	2.94	0.00**
Negative ranks	1		
Positive ranks	12		
Ties	10		
Jobs in agriculture are interesting and exciting.	23	1.5	0.13
Negative ranks	4		
Positive ranks	9		
Ties	10		
Many ethnic groups and races of people are employed in agriculture industry.	23	1.327	0.18
Negative ranks	3		
Positive ranks	6		
Ties	14		

Note. Negative ranks indicate lower post scores than pre scores; positive ranks indicate higher post scores than pre scores; and ties indicate equal pre and post scores.

** $p \leq .001$

Objective 2: Describe the REACH Scholars' perceptions of FANHS for their own career plans both before and after the program.

REACH Scholars were asked to provide written answers to the following question on pretest and posttest: "How do you see the food, agricultural, natural resources, and human sciences incorporated into your future career plans, if at all?" Pretest and posttest responses were compared and coded for each individual REACH Scholar. In analyzing the responses, four themes emerged: (a) changing career plans to specific FANHS plans, (b) making future career plans of a general nature, (c) planning with no specific FANHS career tie-ins, and (d) making no change in plans.

Ten of the 23 REACH Scholars (44%) had changed to specific plan(s) for integrating FANHS into their academic and career plans. On the first day, these participants provided general answers which were not necessarily tied to careers nor to their own career plans. However, on the last day, they shared specific examples, including academic and career plans. A smaller proportion, six (26%) provided future plans of a general nature with no specific tie-ins to FANHS academic or career plans, and one (4%) planned to be a plant pathologist at both pre- and post-program. Another six (26%) provided no complete response to this question. See Table 4 for representative comments among those providing both a pretest and posttest response.

Table 4*REACH Scholars' Dispositions and Representative Comments for FANHS Career and Academic Plans*

Disposition	Representative Responses		Frequency, n (%)
	Pretest Response	Posttest Response	
Changed to specific FANHS plans	"They may play some roles at some times, but I am not certain." (Participant 2021-6)	"I plan to go for Food Science major...so food and agriculture play a significant role in my study and career." (Participant 2021-6)	10 (44%)
Future plans of a general nature; no specific FANHS tie-in	".....I would very much like to be involved and gather as much hands-on experience and knowledge to help bring awareness and contribute my knowledge and labor to this field. (Participant 2018-3)	"With...global warming, lack of natural resources, and overpopulation, I can definitely say that food and agriculture will become a huge part of my future career as the factors mentioned above are highly important to me." (Participant 2018-3)	6 (26%)
No change in plans	"As a plant pathologist, I hope to contribute to sustainable agricultural practices that reinforce the tools available to growers." (Participant 2019-7)	"I see myself working in the agricultural sciences as a researcher and contributing to crop sustainability and health." (Participant 2019-7)	1 (4%)
No complete response provided for comparison	"I don't really know that [FANHS] will be incorporated with me in the future career plan...learn more and have experience more will help me with my future." (Participant 2018-2)	[no response]	6 (26%)

Note. Participant numbers were randomly assigned each year. As an example, "Participant 2018-3" indicates participant number 3 who was a REACH Scholar in 2018.

Conclusions, Discussion, and Recommendations

Overall, the program enlarged the REACH Scholars' perceptions of agricultural careers, and the major implications of this work were that community college students' career development and research acumen were positively influenced by agricultural research and mentoring. REACH

significantly improved the Scholars' personal career perceptions of agricultural job opportunities and their own capabilities, consistent with self-efficacy and outcome expectations components of SCCT (see Wang et al., 2022). Comparably, the REACH Scholars' views about agricultural occupations (e.g., design of farm machinery and forestry), were not significantly different from pretest to posttest. The Scholars' perceptions of occupational requirements did not significantly change except for their perception that agricultural leaders had a college education, which significantly improved over the course of the REACH program.

The Scholars' changed their academic and career plans. In fact, 70% of Scholars changed their plans with 44% of these creating specific plans within FANHS. The written responses about future plans at the beginning and end of the REACH program provide a useful juxtaposition with the *Perceptions of Agriculture and Agricultural Careers* questionnaire as the written responses examined agriculture in the broader sense of FANHS. Collectively, these conclusions point to the expansion of what REACH Scholars considered a "good job in an agricultural occupation" during the program.

The REACH program may have been effective at influencing future plans toward agriculture and the larger view of FANHS, and the program should continue. This research was not designed to show cause-and-effect relationships. However, examining the REACH Scholars' experiences since the program contributes to understanding and improving the program. Of the 23 participants, 30% have graduated from or are currently pursuing degrees from the University of Tennessee, Knoxville in food sciences, engineering, microbiology, and plant sciences. Three of these students continue to conduct undergraduate research in FANH. Of the 2021 cohort, two students still attend community college but continue to work as laboratory assistants under the supervision of agricultural faculty—indicative that an REEU experience helps community college participants be more competitive for career opportunities (Ashcroft et al., 2020; Ashcroft et al., 2021).

Talbert and Larke (1995b) validated the *Perceptions of Agriculture and Agricultural Careers* instrument with Texas high school students. While the participants in this study were community college students, the researchers judged the scale as appropriate as the community college students had limited experiences in agriculture, and none were agricultural majors at the time of the study. In future studies, researchers should consider a specific instrument that would feature agricultural occupations that require Applied Associates (e.g., Pullet Supervisor) and bachelor's degrees (e.g., Broiler Farm Manager). This specific, localized instrument would be advantageous to represent the different academic goals among community college students and the available, localized career opportunities in food and agriculture.

Lent (2013) describes that career development processes are reflective of complex jigsaw puzzles. Certainly, academic aptitude, environmental influences, personal interests, and other factors all contribute to this complexity (Wang, 2022). However, REACH demonstrated an effective outcome evaluation strategy for understanding career planning in the context of an REEU and assessing the REEU program. Responses to the written question, "How do you see the food, agricultural, natural resources, and human sciences incorporated into your future

career plans, if at all?" were particularly important in understanding how the [REACH] experience may have affected career plans. Additional research is needed on how REEU programs may influence overall agricultural literacy. Likewise, research is needed to understand the lived experiences of the REEU participants, including REACH Scholars, to improve undergraduate career development and academic advising. Likewise, researchers have identified this lack of qualitative research as a challenge for the SCCT knowledge base (Wang et al., 2022).

Undergraduate research programs should prioritize community college students, particularly linking community colleges with colleges of agriculture. In addition, college of agriculture faculty should explore ways to engage community college faculty in agricultural research. Building the research capacity of community college faculty would produce additional agricultural research opportunities and enhance community college students' competencies.

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