Conceptions of the Agriculture Industry: How Students Draw Agricultural Professionals

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Introduction

Among many things, nonformal education programs serve many purposes, including offering discipline-specific knowledge and skills while serving as a pipeline for career paths (Affeldt et al., 2017). A food and agricultural-technology nonformal education program was implemented during the summer of 2022 to (1) increase youth understanding of the roles that technology and science play in agriculture, (2) foster their agency to employ agricultural science innovations to solve agricultural and community problems, and (3) increase their interest in the agricultural profession as a potential career path. Participants from both an urban and a rural community in a Midwestern state were engaged in practical learning activities as part of this program, including the use of FarmBots, drones, and PheNodes, harvesting and collecting corn data, interacting with agricultural professionals, and embarking on field trips.

Theoretical Framework

Social Cognitive Career Theory (SCCT) attempts to explain how individuals develop an interest in careers, make choices to pursue specific careers, and perceive themselves as successful in those careers (Lent et al., 2002). SCCT explains that an individual's construct of a career is based on a combination of (1) self-efficacy, or a person's belief that they can or want to perform the career expectations, (2) outcome expectations, or the consequences of attaining a career, and (3) personal goals for career development (Lent et al., 2002). These concepts are all formed and revised through experiences. Therefore, students may change their views on a career in agriculture based on experiences that change their perceptions of this career. The SCCT was used to study the perceptions of careers in agriculture from urban high school students (Henry et al., 2014) and to understand the career decision-making of undergraduate students in an agricultural college in Iran (Rajabi et al., 2012).

Methodology

Drawn images are important in assessing youth's understanding of the world around them, including their perceptions of a specific profession (Knight & Cunningham, 2004). As youth change their perceptions of a profession, they should change their drawing of that profession. To assess participants' perceptions of the agricultural profession, we used visual evaluation measures, specifically a Draw an Agricultural Professional (DAAP) worksheet. The DAAP is an adaption of the Draw-a-Scientist Test (Chambers, 1983) and Draw-an-Engineer Test (Knight & Cunningham, 2004) developed to evaluate perceptions about scientists and engineers using drawn images. Draw-a-Scientist tests have been used to discover stereotypes related to students' perceptions of scientists (Ferguson & Lezotte, 2018) and media influences on perceptions of female scientists (Stienke et al., 2007).

In this study, the DAAP worksheet was administered to participants, ages 11-15, in pre and post sessions. Participants were also asked if they knew an agricultural professional and if so, to write who that agricultural professional was. Although twenty-five worksheets were completed in the pre-session and eleven were completed post-session, eleven drawings from students who participated in both pre-and-post sessions are included in this study. Drawn images and written responses were coded. The study implored a deductive coding strategy using the researchers' pre-established codes and with guidance from previous research asking participants to draw engineers (Fralick et al., 2009). Systematic data coding and analysis were completed between three coders using the Dedoose qualitative analysis software. Codes were used to assess instances of human presence/absence, depictions of gender, location, objects/tools/artifacts, inferences of action, unrelated items, and whether participants knew an agricultural professional and, if so, who they were. Code tally results were imported from Dedoose, and percentages were

calculated using Microsoft Excel. The researchers then conducted further analysis to assess participants' perceptions of the agricultural profession.

Results

Drawings were first assessed for any instances of human presence as depicted using a stick figure or humanoid figure. In the pre-session, 10 drawings (91%) had a human while in the post-session, 9 drawings (82%) had a human. There were no visible depictions of gender in any of the drawings. Some elements that helped to assess the conceptions of an agricultural profession included the tools, objects, or artifacts that were drawn. These included field crops (pre-session=18%; post-session=36%), machines (pre-session=27%; post-session=36%), plants and seeds (pre-session=45%; post-session=27%), among others. Inferences of actions were also assessed to gain an understanding of what agricultural professionals do. Seven drawings in the pre-session (64%) suggested actions including farmer's market sales, planting seeds, and using a drone, among others. Six drawings (55%) of the drawings in the post-session suggested actions including the use of a FarmBot, harvesting, and researching, among others. Beyond the coded data that provide general group insights, pre-post drawings were also assessed to identify program impact at the individual level. As an example, the impact noticed for one participant included a shift from a 'blank page' in the pre-session to the drawing of an agricultural professional using a FarmBot in the post-session. Other gains identified included the diversity in the drawings which were captured by the increase in elements in those drawings.

When asked if they knew any agricultural professional, 27% (n=3) of participants responded with a 'Yes' in the pre-session and 64% (n=7) in the post-session. Conversely, the number of participants who had responded with a 'No' decreased from 55% (n=6) in the pre-session drawings to 37% (n=6) in the post-session drawings. Participants who identified a program staff as an agricultural professional increased from 9% (n=1) in the pre-session to 36% (n=4) in the post-session.

Conclusions

The nonformal education program evaluated with the DAAP was designed to increase the interest of participants in agricultural science as a career path, specifically, careers outside of the traditional role of a farmer. The DAAP offered a glimpse into the participants' definition of an agricultural professional and if the program was successful in including examples youth could use as they construct their views of future career possibilities. While the participants changed their images of an agricultural professional, not all altered their perceptions to include more science and technology. However, the participants were more likely to report knowing an agricultural profession and identifying teachers in the program as agricultural professionals by the end of the experience.

Implications/Recommendations/Impact on the Profession

In nonformal education programs with career aspirations as an outcome, it is important to think about the pictures and images presented to the participants. Are they seeing and experiencing things that allow them to construct an image of themselves in that career? Even more so, are program facilitators specifically discussing career connections in their activities?

This study was designed on the assumption that drawings are related to the career aspirations of program participants. However, recent work on the Draw-a-Scientist-Test with students in Columbia found that stereotypical drawings of scientists were made by the students most likely to want a career as a scientist and that gender was not an indicator (Toma et al., 2022). Therefore, future research should consider the assumption that student drawings are specifically related to career aspirations as agricultural professionals.

References

Affeldt, F., Tolppanen, S., Aksela, M., & Eilks, I. (2017). The potential of the non-formal educational sector for supporting chemistry learning and sustainability education for all students–a joint perspective from two cases in Finland and Germany. *Chemistry Education Research and Practice*, *18*(1), 13-25. https://doi.org/10.1039/c6rp00212a

Chambers, D. W. (1983). Stereotypic images of the scientist: The draw-a-scientist test. *Science education*, *67*(2), 255-265. https://doi.org/10.1002/sce.3730670213

Ferguson, S. L., & Lezotte, S. M. (2019). Exploring the state of science stereotypes: Systematic review and meta-analysis of the Draw-A Scientist Checklist. *School Science and Mathematics, 120*, 55-65. https://doi.org/10.1111/ssm.12382

Fralick, B., Kearn, J., Thompson, S., & Lyons, J. (2009). How middle schoolers draw engineers and scientists. *Journal of Science Education and Technology*, *18*, 60-73. https://doi.org/10.1007/s10956-008-9133-3

Henry, K. A., Talbert, B. A., & Morris, P. V. (2014). Agricultural education in an urban charter school: Perspectives and challenges. *Journal of Agricultural Education, 55*(3), 89-102. https://doi.org/10.5032/jae.2014.03089

Knight, M., & Cunningham, C. (2004, June). Draw an engineer test (DAET): Development of a tool to investigate students' ideas about engineers and engineering. In *ASEE annual conference and exposition* (Vol. 19). https://doi.org/10.18260/1-2--12831

Lent, R. W., Brown, S. D., & Hackett, G. (2002). Social cognitive career theory. In D. Brown & Associates (Eds.), *Career choice and development* (4th ed., pp. 255-311). Jossey-Bass Publishing.

Rajabi, S., Papzan, A., & Zahedi, G. (2012). Application of social cognitive career theory to investigate the effective factors of the career decision-making intention in Iranian agriculture students by using ANN. *SAGE Open, 2*(4), 1-12. https://doi.org/10.1177/2158244012467024

Steinke, J., Lapinski, M. K., Crocker, N., Zietsman-Thomas, A., Williams, Y., Evergreen, S. H., Kuchibhotla, S. (2007). Assessing media influences on middle-school aged children's perceptions of women in science using the Draw-a-Scientist Test (DAST). *Science Communication, 29*(1), 35-64. https://doi.org/10.1177/1075547007306508

Toma, R. B., Orozco-Gomez, M. C., Molano Nino, A. B., Obando-Correal, N. C., & Suarez Roman, R. C. (2022). Testing assumptions of the Draw-a-Scientist-Test (DAST): Do stereotyped views affect career aspirations? *International Journal of Sciene Education, 44*(16), 2423-2441. https://doi.org/10.1080/09500693.2022.2126738