Developing Pedagogical Content Knowledge in Global Agriculture: *Assessing Perceptions of Global Issues in Pre-Service Educators in the GOALS Program.*

Introduction and Conceptual Framework

Embedding a global dimension into education programs is not new. Over ten years ago, Cushner and Brennan (2007) stated that many universities began to embed global education in recognition of the diverse network in the teacher education community. Not long after, The Longview Foundation (2008) suggested that teacher education programs at the time were among the least internationalized programs on American college and university campuses. Agriculture, Food, and Natural Resources (ANR) pre-service teacher candidates who are entering a classroom as a teacher in training with a cooperating teacher (Matson, 2020) are among the members of teacher education programs who can positively affect their host communities through decision making (Rivera & Dann, 2011) related to global learning. Tichnor-Wagner et al. (2019) commented that many global competency training initiatives for teachers have understandable target goals a, but the knowledge, skills, and dispositions needed to excel are unclear; thus, a need exists to better understand the perceptions of pre-service candidates on the global dimension of education, and specifically in the applied STEM context of agricultural education. Global learning in applied STEM contexts like agriculture can be guided through the lens of sustainable development utilizing a framework like the United Nations Sustainable Development Goals (UNSDGs). The UNSDGs offer guidance to instruction related to sustainable development across broad contexts and may improve the global instructional efficacy of pre-service candidates. For successful improvement to occur however, an assessment of the participant perceptions of sustainable development (as defined through the lens of "global issues") was needed to inform the design of teacher training programs that produce globally competent educators. This study helps address the research priority area seven "*Addressing Complex Problems*" in the most recent version of the American Association for Agricultural Education National Research Agenda (Andernoro, Baker, Stedman, & Weeks, 2015).

The conceptual framework for the study guided by the theory for Pedagogical Design Capacity (PDC) refined by Brown (2009) and Knight-Bardsley & McNeill (2016) that details "a teacher's capacity to perceive and mobilize existing resources in order to craft instructional episodes" (Brown, 2009, p. 29). The purpose of this descriptive study was to explore perceptions of global issues of pre-service agricultural teacher education candidates. The study was guided by the following research question: What are the baseline values for awareness, perceived importance, and implementation of lessons and activities based on global issues by participants in Global Orientation to Agricultural Learning (GOALS)?

Methods

A researcher-modified survey instrument "*Perceptions of Global Issues*" that had previously been determined to be valid and reliably using commonly accepted social science research methods as utilized with a purposively selected sample of sixteen pre-service agricultural teacher educators from The Pennsylvania State University and the University of Idaho who applied for and were accepted to an advance professional development program held in conjunction with the World Food Prize Foundation Borlaug Dialogues. The adapted instrument included the Global Perspectives Inventory (RISE, 2017), the Global Competency Measurement from Ariel Tichnor-Wagner (2019), and Global Competence Aptitude Assessment

(Global Competence Associates, 2018). The final instrument includes six parts and participants responded to questions on a 4-point Likert scale with Global Issue Awareness questions requiring a response between "1 – Very Little" to "4 – A lot." The list of global issues was guided by the seventeen United Nations Sustainable Development Goals. Prior to data analysis, the Shapiro-Wilk test was used to determine statistical assumptions and Tukey's Honest Significant Difference Test as a post-hoc test to explore specific group means beyond the ANOVA comparison. All sixteen of the participants submitted a survey, thus, there was no concern of non-response error. As a selected population was used, results would not be generalized outside of participants.

Results/Findings

A Tukey test was performed as recommended by Salkind (2010) to establish a baseline to answer the research question and parse out specific differences between Awareness, Importance, and Implementation across the 17 Global Issues. Within Awareness, Education (μ=3.38) differed significantly from Reduced Inequalities (μ=2.13) In addition to Awareness, Implementation displayed a significant difference between Education (μ=2.38) and both Industry, Innovation, and Infrastructure (μ=1.47) and Sustainable Cities (μ=1.47). The effect sizes (Awareness: $\eta 2$=0.07, Importance: $\eta 2$=0.04, Implementation: $\eta 2$=0.06) for significant differences between student groups were interpreted as medium practical effect (Cohen, 1988).

Conclusions

Of the 17 UNSDGs, goal (4) Quality Education showed highest awareness and implementation which was expected given the population's choice to major in education. A significant discrepancy in awareness came forth between goal (4) and goal (10) Reduced Inequalities, and discrepancies in implementation were present between (4) and both (9) Industry, Innovation, and Infrastructure, as well as (11) Sustainable Cities. As stated previously, the findings from the study were derived from a limited population. The findings do suggest a possible need to address shortfalls in awareness and perceived utility of subjects relating to inequalities, industry, and sustainability. Some possible explanations that would need further investigation might reside in background of the participants and age. Participants from more rural areas with less global experience might not have the same awareness and experience with some global issue types. Only one of the participants claimed to be from an urban location and could explain potential influence of a lack of experience with urban-centric goals (9 and 11).

Recommendations for Profession

Klein & Riordan (2009) reported that level of teacher engagement having a positive association with how much educators implement content from professional development opportunities. These results will help inform current teacher education programs on which areas of content knowledge related to global issues to address and future professional development efforts with more attention to areas that pre-service educators have identified a need for support. Further research is needed beyond awareness exploring educators' nuanced comprehension of these global issues, contributions to efficacy from pedagogical experience, implementation into classroom practices and impact on student learning outcomes.

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