Agriculture Teachers' Use of Laboratory Facilities: A Pilot Study

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Introduction and Theoretical Framework

Agricultural laboratories are widely used to support instruction in agricultural education programming in public schools (Shoulders & Myers, 2012). Agricultural laboratories include agricultural mechanics facilities, greenhouses, aquaculture ponds, and more, all of which are designed to provide hands-on, agriculturally-focused learning experiences for public school students (Phipps et al., 2008). Beyond serving as spaces to facilitate direct instruction to students, agricultural laboratories also support other aspects of the complete agricultural education program, such as providing space for students to engage in their Supervised Agricultural Experiences (SAEs) (Doss et al., 2019). Consequently, agriculture teachers should be well-prepared to actively use the agricultural laboratories found within their respective programs (Shoulders & Myers, 2012). Considering these notions, our study was underpinned by human capital theory (HCT). HCT suggests that investing in training (e.g., university course activities, professional development workshops, etc.) for individuals, such as agriculture teachers, will improve their productivity and effectiveness (Tan, 2014). In the context of agricultural teacher education in Illinois, gaining insight into the agricultural laboratories available to agriculture teachers and their perceptions regarding agricultural laboratory use helps the profession proactively address agricultural education workforce development there.

Purpose and Methods

The purposes of our pilot study were to: (1) validate an instrument for assessing agriculture teachers' use of and perceptions regarding agricultural laboratories and (2) describe the available agricultural laboratories for agriculture teachers in Illinois. Using Shoulders and Myers' (2012) prior research as our guidepost, we selected and modified the items for our instrument from their study. Our instrument included three different constructs of items related to agriculture teachers' perceptions regarding using agricultural laboratories: (1) *Student Learning*, (2) *Preparation Required*, and (3) *Barriers*. To establish content and face validity, we asked a panel of three agricultural teacher educators with previous experience using agricultural laboratories to examine our instrument. Each panel member provided feedback and we modified those items based on their recommendations.

There are 563 agriculture teachers in Illinois. We first used Krejcie and Morgan's (1970) sample size calculation formula to identify an original sample size of 229 agriculture teachers. We then elected to oversample within our population to help address low response rate concerns, an approach recommended by Doss et al. (2022). Shoulders and Myers (2012) used a similar tactic. Our final sample included 344 randomly-selected agriculture teachers. We followed Dillman et al.'s (2014) recommendations regarding employing five points of contact with the 344 agriculture teachers within our sample. One-hundred and thirty-three agriculture teachers responded to our instrument, yielding a 38.7% response rate. We used the IBM SPSS Statistics (Version 26.0) software to analyze our data. We used descriptive statistics (i.e., frequencies and percentages) to analyze our data. To check for non-response error, we conducted independent samples *t*-tests to compare early and late respondents' responses on items within our three constructs. We found no significant differences between the two groups ($p < .05$). According to

Lindner et al. (2001), comparing early and late respondents is an acceptable method of determining non-response error in agricultural education research.

Results

We conducted a post-hoc analysis of the Likert-type questions to assess the reliability of the three aforementioned constructs we used in our instrument. In the context of using George and Mallery's (2003) interpretations, the Cronbach's alpha coefficients for the *Preparation Required* ($\alpha = .852$) and *Barriers* ($\alpha = .812$) constructs were considered good while the *Student Learning* ($\alpha = .924$) construct was considered excellent. Our pilot study also yielded important data on the agricultural laboratories available to Illinois agriculture teachers (see Table 1).

Table 1

Available Laboratories Identified by Respondents (n = 133)

Item	*f*	%
Mechanics / Carpentry / Welding Facility	112	84.2
Greenhouse	99	74.4
Hydroponics	81	60.9
Land Laboratory (Field Crops)	74	55.6
Landscaping Area	55	41.4
Agriscience / Biotechnology Laboratory	53	39.8
Garden	46	34.6
Food Science Laboratory	40	30.1
Aquaculture Tank / Pond	32	24.1
Floral Design Laboratory	25	18.8
Small Animal / Veterinary Laboratory	19	14.3
Forestry Plot	11	8.3
Nursery / Orchard / Grove	10	7.5
Livestock / Equine Facility	8	6.0
Turf Grass Management Area	8	6.0
Apiary (Beekeeping)	7	5.3
Chicken Coop / Run	3	2.6
Meats Laboratory	1	0.8
Vineyard	1	0.8
Virtual Welding Laboratory	1	0.8

Conclusions and Recommendations

Based on our findings, we concluded that: (1) our instrument is valid and reliable and (2) agriculture teachers in Illinois most commonly have access to agricultural mechanics facilities, greenhouses, and hydroponics laboratories. We recommend that: (1) this study be replicated on a national level similar to Shoulders and Myers' (2012) work and (2) agricultural teacher educators in Illinois use our findings to ensure that their pre-service agriculture teachers are better-prepared to properly use the agricultural laboratories they will most likely encounter during their careers. Doing so will help address human capital development needs (Tan, 2014) for the future.

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