Journal of Agricultural Education, 63(1), 13-28
https://doi.org/10.5032/jae.2022.01013

Meeting the Needs of Gifted and Talented Students in Agricultural Education: An Exploratory Study

Olivia M. Hile[1], Tyson J. Sorensen[2], and Aaron J. McKim [3]

Abstract

Agriculture teachers are responsible for the education of a mixed ability classroom, in which there may be students identified as gifted. It is unclear how much preservice preparation agriculture teachers receive in order to challenge this population of students or what inservice teacher professional development needs exist. This study aimed to measure agriculture teacher attitudes toward working with gifted students as well as their preservice teacher preparation and current professional development needs. Just over half of participants that completed a traditional teacher preparation program felt adequately prepared to meet the needs of gifted students in their classrooms. Agriculture teachers mostly agreed that students should be challenged, gifted students are a valuable part of their classroom, and that differentiating for gifted students is important. Responding teachers mostly disagreed that their content knowledge is challenged, gifted students are bored in their classrooms, and that they feel threatened by the intelligence of gifted students in their class. Professional development is needed in creating challenging classroom content, differentiating instruction and teaching problem-solving skills to gifted agriculture students.

Keywords: differentiation; gifted; professional development; talented; teacher preparation

Author Note: The authors report no conflicts of interest. Olivia M. Hile (https://orcid.org/0000-0003-2001-375X), Tyson J. Sorensen (https://orcid.org/0000-0003-2103-1669), and Aaron J. McKim (https://orcid.org/0000-0002-0600-3611).

Introduction

The third research priority for the American Association for Agricultural Education 2016-2020 states the importance of developing a "sufficient scientific and professional workforce that addresses the challenges of the 21st century" (Stripling & Ricketts, 2016, p. 29). Talented and skilled individuals are needed to fill highly technical jobs in the agricultural industry; however, a greater number of jobs are predicted to be available than qualified college graduates (Goecker et al., 2015). Despite some negative attitudes toward agricultural work among gifted students (Overbay & Broyles, 2008), shortages of a talented agricultural workforce may be mitigated if more gifted and talented students entered the agricultural workforce. School-based agricultural education (SBAE) plays an important role in preparing students for careers in agriculture. Therefore, Career and Technical Education (CTE) should be promoted as a viable option for gifted students (Gentry et al., 2008). Yet, limited research has been conducted studying gifted students in SBAE programs in the United States.

[1] Olivia M. Hile is a Graduate Student in the Department of Community Sustainability at Michigan State University, 480 Wilson Road, East Lansing, MI 48824, hileoliv@msu.edu.

[2] Tyson J. Sorensen is an Assistant Professor of Agricultural Education in the Department of Applied Sciences, Technology and Education at Utah State University, 2300 Old Main Hill, Logan, UT 84322, tyson.sorensen@usu.edu.

[3] Aaron J. McKim is an Assistant Professor in the Department of Community Sustainability at Michigan State University, 480 Wilson Road Room 131, East Lansing, MI 48824, amckim@msu.edu.

Agriculture teachers are responsible for educating students with a wide variety of learning needs, some of which may be gifted and talented, having divergent educational needs. Agriculture teachers need the "ability to work with diverse groups" (Roberts et al., 2007, p. 9), which should also include gifted and talented students. When interviewing academically and intellectually gifted students about their teachers, Gray (2011) found mixed ability classrooms caused their teachers to struggle and "took away from their opportunities to excel" (p. 67). However, it is unclear if preservice agriculture teachers receive any training in working with gifted and talented students before joining the profession. The ability of in-service teachers to work with gifted and talented students is also unclear. According to literature outside of agricultural education, in-service and preservice teachers have varying views of giftedness (Berman et al., 2012; Carman, 2011; Geake & Gross, 2008; Megay-Nespoli, 2001). Yet, little is known about the views of SBAE teachers toward giftedness. In this study, we sought to understand the perceptions and needs of SBAE teachers in educating gifted students.

While the National Center for Educational Statistics (2018) reported approximately 6.7% of students nationally participate in gifted and talented programming, it is difficult to know exactly how many gifted students enroll in SBAE courses. The number of students identified by each state to receive gifted services that also participate in SBAE is not regularly reported. Although state and national estimates vary greatly, Gagné (2000) suggests 10% of students within any particular domain or field are gifted. One study found agriculture teachers in Utah estimated 22% of their students as gifted (Overstreet & Straquadine, 2001). While the exact number of students identified as gifted within SBAE is unknown, the necessity to understand and meet the needs of all students within each classroom is important. When comparing the wealth of current literature regarding special needs education in SBAE (e.g., Aschenbrener et al., 2010; Easterly & Myers, 2011; Johnson et al., 2012; Pense, 2009; Smith & Rayfield, 2019) to the dearth of current literature regarding gifted students in SBAE (e.g., Israel et al., 2012), it seems research regarding gifted students within SBAE is not prioritized. Pandya and Curtis (1981) suggested "…agriculture teachers and their programs need to adapt to the changing needs of gifted students" (p. 11). To accomplish this, more research needs to be conducted to understand SBAE teachers' needs, preparation, and attitudes toward teaching gifted students, a need addressed by the current study.

Literature Review

The first federal definition of gifted and talented in the Marland Report (1971) defined gifted and talented individuals as "…those identified by professionally qualified persons who by virtue of outstanding abilities, are capable of high performance" (p. 8). While definitions have continued to adapt, many students in SBAE possess specific capabilities to be considered gifted within agriculture but may not receive the same consideration in other academic subjects (Hile & Hunsaker, 2021).

Teaching in a classroom with a wide range of student abilities and backgrounds can be challenging. Teachers in all subject areas have been tasked with identifying "students' specific learning needs, particularly students with disabilities, students who are limited English proficient, students who are gifted and talented, and students with low literacy levels, and the tailoring of academic instruction to such needs" (Higher Education Opportunities Act, 2008, p. 122), which includes gifted students in SBAE. Tomlinson (2014) examined the concept of differentiated instruction which assumes each student is unique in their educational requirements and should be instructed in a way that meets their individual needs. Utilizing differentiation in the heterogeneous, mixed ability classroom may be one way to reach gifted students. While differentiation of instruction and assessment can provide benefit to the diversity of students within a classroom, there are challenges in working with gifted students (e.g., lack of subject knowledge, classroom management, attitudes and beliefs) (VanTassel-Baska & Stambaugh, 2005). For example, Hansen and Feldhusen (1994) argued many teachers feel threatened by the intellectual abilities of gifted students, and therefore "fall short of a reasonable standard for teaching gifted students" (p. 115). Farkas and Duffett (2008) found 73% of teachers in a national survey agreed that gifted students are often bored and under-challenged in school.

Beyond differentiating instruction, common teaching strategies and characteristics identified in the literature as effective for gifted students include the use of advanced curriculum, critical thinking, problem-solving, project and problem-based learning, and allowing for student autonomy (Gentry et al., 2007; VanTassel-Baska & Hubbard, 2016). Furthermore, research has found that, according to gifted and talented students in STEM and CTE courses, their education was more positive when their teachers were highly skilled, held high expectations, showed personal interest in students, provided student autonomy, and provided relevance in the content (Gentry et al., 2007; Mullet et al., 2018).

Existing literature in gifted education includes insights into how teachers can effectively meet the instructional needs of gifted students; however, it is also noted that preservice teacher education programs do not adequately prepare teachers to meet the needs of gifted students (Berman et al., 2012; Hansen & Feldhusen, 1994). According to Plucker et al. (2015), only two states are known to require coursework in gifted education for teachers. As a result, studies have shown deficiencies in preservice teachers' ability to effectively teach gifted students. For example, Tomlinson et al. (1994) found preservice teachers had difficulty identifying traits common to gifted and talented students. Megay-Nespoli (2001) found preservice teachers recognize student differences but do not know how to match their teaching strategy with the associated need.

Conversely, studies have shown teachers trained in gifted education have more positive beliefs and skills in the classroom, foster more creativity in their classrooms, and have classroom climates that are more positive than teachers not trained in gifted education (Berman et al., 2012; Hansen & Feldhusen, 1994). While the literature seems to clearly indicate the importance of some teacher training related to gifted students, little is known about the training and preparation of preservice agriculture teachers to instruct gifted students.

For both in-service and preservice teachers, professional development training specific to gifted education has been shown to increase teacher effectiveness in working with gifted students. For example, Megay-Nespoli (2001) found ability and confidence in identifying, assessing, adapting and individualizing instruction for academically talented learners increased after professional development training, whereas the confidence and perceived ability decreased for preservice teachers who did not receive training. Furthermore, some teachers who complete professional development training addressing differentiation and teaching gifted students have been found to be "more positive about both the intellectual and social leadership characteristics of gifted children and are less negative about their potential social noncompliance" (Geake & Gross, 2008, p. 225). Interestingly, research shows teachers tend to think of gifted students as social misfits and antisocial leaders who possess high cognitive abilities (Geake & Gross, 2008). Because teachers' beliefs about giftedness can influence their teaching practice (Berman et al., 2012), researchers have recommended professional development activities for teachers should directly address negative teacher attitudes toward giftedness (Geake & Gross, 2008).

Many studies have been conducted over the years to identify the professional development needs of SBAE teachers. Among the studies in the last decade, items related to teaching special needs students have emerged (Aschenbrener et al., 2010; DiBenedetto et al., 2018; Sorensen et al., 2010; Touchstone, 2015). Despite the various studies in agricultural education related to working with special needs populations, most are vague or relate explicitly to students with learning disabilities (e.g., Elbert & Baggett, 2003; Pense et al., 2010); none of the studies specifically address gifted students. The need for research exploring agriculture teachers' professional development needs related specifically to gifted students is, therefore, essential and timely.

Theoretical and Conceptual Framework

The theoretical framework for this study was Gagné's (2010) differentiated model of giftedness and talent (DMGT). The DMGT distinguishes between the terms *gifted* and *talented*, and identifies many variables that contribute to the complexity of both. To differentiate gifts from talents, the DMGT describes giftedness in terms of potential, aptitude, and promise while the terms realization, achievement, and fulfillment are used to describe talent (Gagné, 2010). The DMGT is comprised of four major components: (a) natural abilities, (b) catalysts, (c) developmental process, and (d) competencies.

According to Gagné (2000), giftedness refers to natural abilities in at least one domain (e.g., physical, mental) that "places an individual among the top 10% of age peers" (p. 67). These natural abilities (i.e., gifts) contribute to the developmental process of individuals, which then can become talents (i.e., competencies). Talents refer to "the superior mastery of systematically developed abilities (or skills) and knowledge in at least one field of human activity, to a degree that places an individual within the top 10% of age peers who are (or have been) active in that field" (Gagné, 2000, p. 67). Talent exists across many domains, including CTE and agriculture (Gagné, 2010; Gentry et al., 2008). Talents are specific to a human activity or career field, which suggests giftedness is not instantly compatible with a specific career field, and a developmental process must take place (Gagné, 2000).

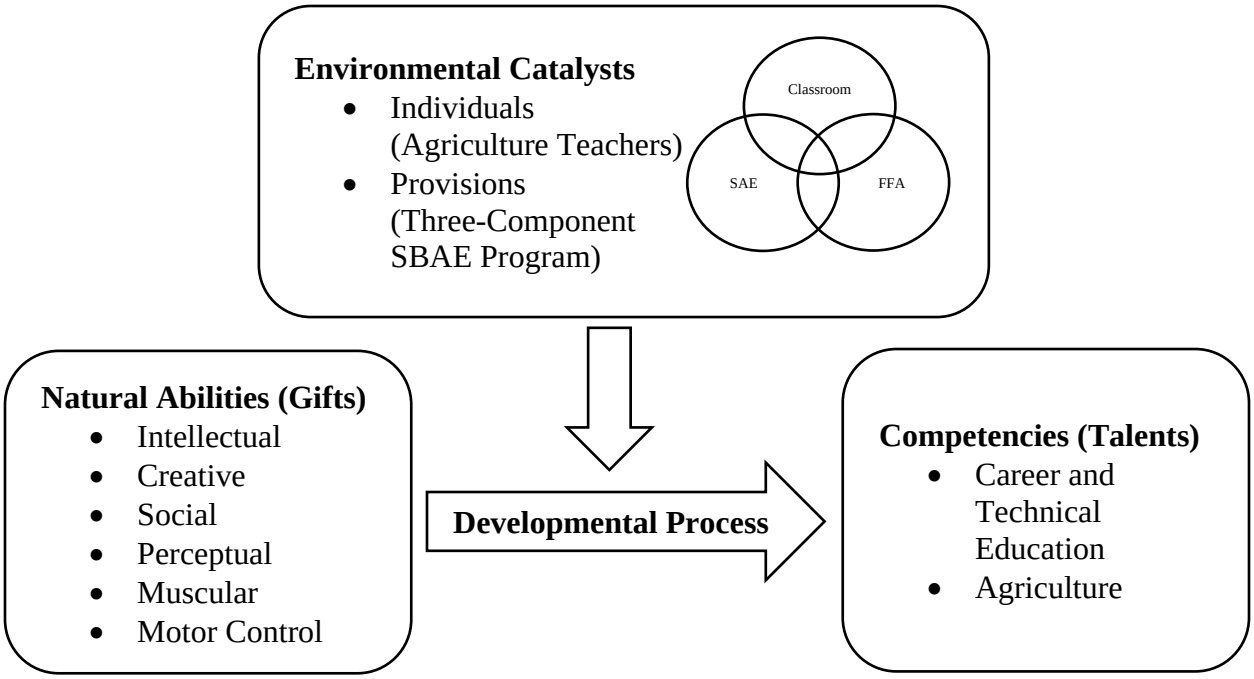
The developmental process of individuals is characterized by learning that can be both formal and informal and where giftedness is transformed into talent (i.e., competencies) under the influences of intrapersonal, environmental, and chance catalysts (Gagné, 2000, 2004, 2010). Intrapersonal catalysts are physical and psychological factors that occur within an individual, such as a student's self-management, motivation, and temperament. Chance catalysts refer to unpredictable and uncontrollable factors that can positively or negatively influence the developmental process. For example, the family of origin or the resources available at the particular school would constitute chance catalysts (Gagné, 2010).

Environmental catalysts involve all influences outside of the individual, which according to Gagné (2010), include milieu (e.g., physical, cultural, social), individuals (e.g., parents, teachers, peers), and provisions (e.g., curriculum, pedagogy, grouping). Environmental influences, such as a teacher's classroom environment, can have positive and/or negative effects on a student's development (Gagné, 2000). This concept emphasizes the important role of the teacher in the talent development process. For this study, we focused our attention primarily on these environmental catalysts; specifically, environmental catalysts related directly to the developmental process. To operationalize the environmental catalysts within SBAE, *individuals* were defined as agriculture teachers and *provisions* were defined broadly as SBAE programs. Teacher attitudes were studied as varying attitudes have been found amongst teachers (Berman et al., 2012; Geake & Gross, 2008; Megay-Nespoli, 2001). Furthermore, we contextualized and situated this study within the three-component model of SBAE (National FFA Organization, 2019b).

The SBAE program exists as an environmental catalyst, involving both the programmatic structure and the agriculture teacher. The general delivery model within SBAE is comprised of three components: (a) classroom, (b) supervised agricultural experience (SAE), and (c) the FFA organization (National FFA Organization, 2018). The DMGT was utilized for this study to support the argument that theoretically, gifted students are found in SBAE programs, and SBAE can influence the development process for gifted students through classroom instruction, FFA, and/or SAE (see Figure 1). This study focused on the influence that agriculture teachers have on the developmental process of gifted students, by examining agriculture teachers' attitudes and professional development needs related to gifted students and within the context of the three-component model of SBAE.

Figure 1

Conceptual Framework Utilized for the Current Study



Note. Adapted from the DMGT (Gagné, 2010) and the three-component model of SBAE (National FFA Organization, 2019a).

Purpose and Research Objectives

This study describes school-based agriculture teachers' attitudes toward working with gifted students in the agriculture classroom and identifies professional development needs related to teaching gifted students. Little is known about how teachers respond to the needs of gifted students within agricultural education. The following research questions guided this study.

1. What are the experiences of agriculture teachers working with gifted students (i.e., path to teacher licensure, percent of gifted students in agriculture program, time spent addressing gifted education, adequate preparation)?
2. What are the attitudes of inservice agriculture teachers regarding the education of gifted students?
3. What are the professional development needs of inservice agriculture teachers related to the education of gifted students?

Methods

As part of a larger research inquiry, this quantitative study utilized survey research methodology. The initial population for this study consisted of approximately 13,000 secondary level agriculture teachers in the United States during the 2017-2018 school year (National FFA Organization, 2019b). A national random sample of agriculture teachers were utilized for this study. The sample was proportional to each of the National FFA regions (i.e., western, eastern, southern, central), so that one region was not oversampled when compared to other regions (National FFA Organization, 2018). We determined the appropriate sample size based on Cochran's (1977) sample size determinant formula, which suggested 5% as the acceptable margin of error for any sample with categorical data. Accordingly, figuring a 95% confidence level, 5% sampling error, and a 50/50 split, we determined 370 participants were needed for a representative sample of the population (Cochran, 1977, as cited in Vaske, 2008). Oversampling was used

to mitigate a lower response rate common in web-based surveys (Roberts & Allen, 2015; Saleh & Bista, 2017; Shih & Fan, 2008). Therefore, a sample of 740 agriculture teachers was obtained by the National FFA Organization, which consisted only of email addresses. The National FFA Organization was utilized to provide the sample frame because it maintains an active database of agriculture teachers across the country. The contact information supplied by the National FFA Organization is self-reported by teachers and SBAE programs themselves; therefore, there is a possibility for frame error, which could be a limitation in this study.

The questionnaire was distributed to participants using Qualtrics, an online survey software, in the Spring of the 2018-2019 school year. Emails were sent with a link to the questionnaire to encourage teachers to participate. To encourage participation and increase response rate, we sent three additional reminder emails to non-respondents, over the course of two weeks (Dillman et al., 2014). A total of 45 emails bounced back as non-recognizable and eight respondents were removed because they did not meet study parameters (e.g., were not agriculture teachers). As a result, the sample frame was readjusted to 687 accessible and viable sample participants. Additionally, gift card incentives were utilized to try to increase response rate. In total, 117 usable surveys were collected from the possible 687 accessible participants, yielding a response rate of 17% (n = 117). Because the response rate did not meet the requirement for generalizability to the entire population of SBAE teachers in the country, the findings and recommendations are not intended beyond the scope of the participants in this study. As researchers, we argue this study is a useful and important step toward addressing the gap in the literature regarding gifted students in SBAE, despite the limitation of national generalizability.

With our inability to achieve a high response rate, it was important to address nonresponse bias (Lindner et al., 2001). Because the sample frame did not include phone numbers for contacting non-respondents, we compared early to late respondents as recommended by Lindner et al., (2001), with early respondents being identified as participants in the first two survey emails (n = 66) and late respondents as those in the last two email reminders of the survey (n = 51). Using an independent samples t-test with a Bonferroni correction (Armstrong, 2014), we found no statistically significant differences for instrument items between early and late responders (p-values ranged from .07 – .99). The data were downloaded into the Statistical Package for the Social Sciences and coded for analysis.

The four sections of the survey instrument discussed in this research are: (a) experiences related to teaching gifted students, (b) attitudes toward teaching gifted students, (c) professional development needs, and (d) participant demographic information. In the first section of the instrument, participants were asked what percentage of their agriculture students were identified as gifted, how they obtained their license to teach agriculture, if their teacher preparation program addressed working with gifted students, the amount of class time in their teacher preparation program spent addressing gifted education, and to what degree they felt their teacher preparation program prepared them to meet the needs of gifted students. A definition for gifted was not given to teachers. Participants were also asked what percentage of students they perceived as gifted. For respondents answering with a range, the median was used for analysis. Responses that included “less than…”, “unknown” and “don’t know” were omitted from the analysis of that question, as well as one response identifying 100% of students as gifted.

The second section of the survey focused on participant attitudes. Twelve individual, researcher developed items rooted primarily in the gifted education literature and previously utilized surveys (e.g., Caldwell, 2012; Gagné & Nadeau, 1991, as cited in Troxclair, 2013; Tomlinson et al., 1995) were used to measure different aspects (e.g., teaching practices, social value, teacher-student relationship) of agriculture teacher attitudes toward teaching gifted students. Participants rated each of the 12 items on a six-point scale from 1 (*strongly disagree*) to 6 (*strongly agree*). Sample items included, “I believe it is important to differentiate instruction to meet the needs of gifted students,” “I believe gifted students are valuable to the agriculture industry,” “I feel threatened by the intelligence of gifted students in my class,” and “Agricultural education classes do a better job meeting the needs of gifted students than other classes

in the school."

Professional development needs were assessed using the Borich (1980) needs assessment model. A total of 17 needs-assessment items were included in the questionnaire. Participants were asked to rate their perceived importance and ability for each item on a 4-point scale from 1 (*no importance*) to 4 (*very high importance*), and 1 (*no ability*) to 4 (*very high ability*). Items utilized in the questionnaire were derived from previous needs assessment literature in agricultural education and gifted education and adapted for this study (e.g., Caldwell, 2012; Garton & Chung, 1997; Layfield & Dobbins, 2003; Sorensen et al., 2010). We divided each of the professional development items into the three programmatic areas of agricultural education: (a) classroom (eight items), (b) SAE (four items), and (c) FFA (five items). Sample items included, "differentiating instruction for gifted students in agriculture classes," "helping gifted students choose an SAE project," and "working with gifted students in leadership roles." The final section of the instrument focused on participant demographic information. Participants were asked general demographic questions including their gender, number of years they had been teaching, and in what type of community they taught (i.e., metro urban area: greater than 200,000 in population, urban: between 50,000 and 199,999 in population, urban cluster: between 2,500 and 49,999, and rural: less than 2,499 in population).

A panel of experts consisting of three professors, one specializing in gifted education and two specializing in agricultural education and survey research methodology, reviewed and critiqued the instrument for content and face validity as well as overall quality. Changes to the instrument were made based on input from these experts. As part of the larger study, pilot tests of SBAE teachers in North Carolina and Utah were conducted to establish construct and instrument reliability. The list of contact information for the pilot study was cross-referenced with the random sample provided by the National FFA Organization to ensure teachers were not in both samples. The results of the pilot studies indicated a robust instrument with the need to analyze and report each attitude item individually as there was little evidence to support constructs.

Research questions one (i.e., what are the experiences of agriculture teachers working with gifted students?) and two (i.e., what are the attitudes of agriculture teachers regarding the education of gifted students?) were descriptive in nature and were accomplished by determining and reporting frequencies and percentages. In order to accomplish research question three (i.e., what are the professional development needs of inservice agriculture teachers related to the education of gifted students?), we calculated mean weighted discrepancy scores (MWDS) for each of the 17 needs-assessment items (Borich, 1980). The higher the MWDS, the higher the perceived need for professional development. Data were imported into the Mean Weighted Discrepancy Score Calculator, a pre-programmed Excel document developed by McKim and Saucier (2011), to calculate MWDS. We ranked and organized each professional development need accordingly based on the MWDS of each item.

Of the responding teachers (n = 104), 59.61% were female, and 40.38% were male. Responding agriculture teachers had an average of 13.54 years of teaching experience (SD = 10.35) with years of teaching ranging from 1 to 40. Community type was reported as a categorical variable with population ranges for each category given to participants in the survey. A majority of the participants (44.20%) taught in a rural (less than 2,500) or urban cluster (41.30%, between 2,500 – 49,999) community type, while only 14.4% reported teaching in urban (between 50,000 – 199,999) or metro urban (greater than 200,000) communities.

Results

In accordance with the first research question, we explored the experiences of agriculture teachers working with gifted students. Of the responding teachers (n = 117), the majority completed a licensed undergraduate (70.10%, f = 82) or graduate (16.20%, f = 19) teacher preparation program with the

remaining teachers being alternatively certified (13.70%, *f* = 16). Respondents completing a traditional teacher preparation program were asked to what degree their preparation addressed working with gifted students and if they felt adequately prepared to meet the needs of gifted students (see Table 1). Of those completing a teacher preparation program, 62.00% agreed (either somewhat agreed, agreed, or strongly agreed) that their program "addressed the topic of working with gifted students." However, only 54.50% agreed (either somewhat agreed, agreed, or strongly agreed) that their teacher preparation program "adequately prepared me to meet the needs of students identified as gifted in my agriculture classes."

Table 1

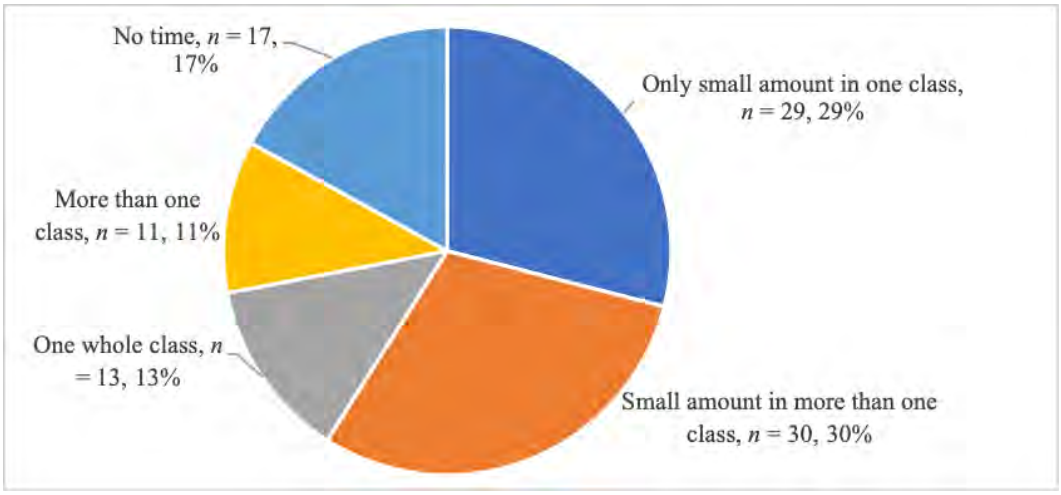
Teacher Preparation Program and Educating Gifted Students (n = 99)

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Teacher preparation	*f*/%	*f*/%	*f*/%	*f*/%	*f*/%	*f*/%
Topical coverage	6/6.0	19/19.0	13/23.0	33/33.0	26/26.0	3/3.0
Perceived preparation	7/7.1	20/20.2	18/18.2	29/29.3	23/23.2	2/2.0

Note. Full statements were "My teacher preparation program addressed the topic of working with gifted students" and "My teacher preparation program adequately prepared me to meet the needs of students identified as gifted in my agriculture classes."

The amount of time spent addressing gifted education within the teacher preparation program was a categorical variable with the majority of teachers receiving training as "a small amount in more than one class (30.00%; see Figure 2). However, 17.00% reported that "no time" was spent addressing gifted education in their teacher preparation program. When asked about their students' giftedness, respondents perceived 9.82% (*SD* = 12.44) of their students as gifted, ranging from zero to 75.00% gifted.

Figure 2



For the second research question, our focus turned to the attitudes of school-based agriculture teachers regarding the education of gifted students (see Table 2). The three statements receiving the most agreement (somewhat agree, agree, and strongly agree) were: "All students should be challenged to the level they are capable" (*f = 113; 98.70%*), "I believe gifted students are a valuable part of my classroom" (*f = 113; 98.30%*), and "I believe it is important to differentiate instruction to meet the needs of gifted

students" (*f = 111; 96.5%*).The three statements receiving the least agreement were: "I feel threatened by the intelligence of gifted students in my class" (*f = 8; 6.90%*), "Gifted students are bored in my classroom" (*f = 35; 30.5%*), and "Gifted students challenge my understanding of the content in the classroom" (*f = 66; 57.40%*).

Table 2

SBAE Teacher Attitudes Toward Gifted Students (n = 114)

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
	f/%	*f/%*	*f/%*	*f/%*	*f/%*	*f/%*
All students should be challenged to the level they are capable	1/0.9	0/0	0/0	6/5.3	60/52.2	47/41.2
I believe gifted students are a valuable part of my classroom	1/0.9	0/0	1/0.9	4/3.5	39/33.9	70/60.9
I believe it is important to differentiate instruction to meet the needs of gifted students	3/2.6	0/0	1/0.9	13/11.3	55/47.8	43/37.4
I think the needs of gifted students should be addressed in the classroom	1/0.9	1/0.9	2/1.7	15/13.0	61/53.0	35/30.4
Agricultural education supports gifted learners	2/1.7	0/0	7/6.1	34/29.6	49/42.6	23/20.0
My teaching takes gifted students into account	1/0.9	0/0	7/6.1	24/20.9	60/52.2	23/18.5
I differentiate instruction to meet the needs of gifted students	1/0.9	3/2.6	7/6.1	37/32.2	50/43.5	17/14.8
I believe gifted students are valuable to the agriculture industry	1/0.9	2/1.7	1/0.9	2/1.7	34/27.4	75/60.5
Agricultural education classes do a better job meeting the needs of gifted students than other classes in the school	1/0.9	8/7.0	17/14.8	47/40.9	27/23.5	15/13.0
Gifted students challenge my understanding of the content in the classroom	11/9.6	26/22.6	12/10.4	27/23.5	26/22.6	13/11.3
Gifted students are bored in my classroom	16/14.0	37/32.5	26/22.8	27/23.7	5/4.4	3/2.4
I feel threatened by the intelligence of gifted students in my class	56/48.7	42/36.5	9/7.8	5/4.3	2/1.7	1/0.9

To answer research question three, we identified the professional development needs of inservice agriculture teachers relating to the education of gifted students (see Table 3). Each item was placed on a six-point Likert-scale for importance and ability. *MWDS* was used to rank the items. The top four items based on importance, beginning with the most important, were: teaching gifted students problem-solving skills (M = 3.48; SD = 0.54), working with gifted students in CDE teams (M = 3.45; SD = 0.61), helping gifted students identify agricultural interests (M = 3.42; SD = 0.59), and working with gifted students in leadership roles (M = 3.41; SD = 0.62). The bottom four items based on importance, beginning with the least important, were: managing the behavior of gifted students (M = 3.10; SD = 0.92), helping gifted students apply for proficiency awards (M = 3.12; SD = 0.77), providing additional content in the curriculum for gifted students (M = 3.24; SD = 0.72), and helping gifted students complete SAE projects (M = 3.26; SD = 0.64).

Table 3

Ranked Mean Weighted Discrepancy Scores for the Needs Assessment (n = 101)

Borich needs assessment items	Importance *M/SD*	Ability *M/SD*	*MWDS*
Providing challenging agriculture curriculum for gifted students	3.39/.63	2.92/.67	1.61
Differentiating instruction for gifted students in agriculture classes	3.30/.70	2.89/.71	1.34
Teaching gifted students problem-solving skills	3.48/.54	3.11/.65	1.25
Motivating gifted students in agriculture classes	3.37/.64	3.03/.57	1.10
Helping gifted students identify agricultural interests	3.42/.59	3.10/.56	1.08
Providing additional content in the in the curriculum for gifted students	3.24/.72	2.92/.75	1.00
Motivating gifted students to join the FFA	3.38/.67	3.11/.74	0.91
Utilizing technology with gifted students	3.34/.67	3.15/.72	0.64
Helping gifted students choose an SAE project	3.31/.69	3.12/.67	0.59
Helping gifted students apply for proficiency awards	3.12/.77	2.94/.79	0.53
Helping gifted students complete SAE projects	3.26/.64	3.10/.64	0.52
Helping gifted students apply for FFA degrees	3.35/.68	3.20/.75	0.47
Working with gifted students in leadership roles	3.41/.62	3.27/.68	0.45
Teaching gifted students record keeping skills	3.29/.70	3.16/.66	0.43
Working with gifted students in CDE teams	3.45/.61	3.32/.65	0.41
Working with gifted FFA members in the FFA chapter	3.35/.62	3.28/.59	0.24
Managing the behavior of gifted students	3.10/.92	3.18/.76	-0.22

The top four items for ability were: working with gifted students in CDE Teams (M = 3.32; SD = 0.65), working with gifted FFA members in the FFA chapter (M = 3.28; SD = 0.59), working with gifted students in leadership roles (M = 3.27; SD = 0.68), and helping gifted students apply for FFA degrees (M = 3.20; SD = 0.75). The bottom four items for ability were: differentiating instruction for gifted students in agriculture classes (M = 2.89; SD = 0.71), providing additional content in the curriculum for gifted

students (*M* = 2.92; *SD* = 0.75), providing challenging agriculture curriculum for gifted students (*M* = 2.92; *SD* = 0.67), and helping gifted students apply for proficiency awards (*M* = 2.94; *SD* = 0.79).

The importance and ability means were then used to calculate the *MWDS* with higher *MWDS* indicating more need for inservice. The top four areas of professional development need were providing challenging agriculture curriculum for gifted students (*MWDS* = 1.61), differentiating instruction for gifted students in agriculture classes (*MWDS* = 1.34), teaching gifted students problem-solving skills (*MWDS* = 1.25), and motivating gifted students in agriculture classes (*MWDS* = 1.10).

Conclusions, Implications, and Recommendations

The agricultural industry needs talented individuals to perform highly technical jobs to solve the complex problems of tomorrow. Gifted students in agriculture courses could rise to this challenge. Agriculture teachers need to be equipped with teaching tools that motivate and challenge gifted students in their classrooms. The goal of this project was to describe teacher attitudes, their teacher preparation programs, and professional development needs associated with teaching gifted students. This study should be viewed as a starting point, as limited research within school-based agricultural education exists on this topic.

The majority of participants were licensed through an undergraduate teacher preparation program and not all teacher preparation programs, whether undergraduate or graduate, address working with gifted students. Just under half of agriculture teachers licensed through a teacher preparation program did not feel as though they were adequately prepared to meet the needs of gifted students, which may illuminate a deficiency in preservice agriculture teacher and secondary education preparation. Agriculture teachers are not being prepared to teach gifted and talented students in a consistent manner from program to program. Future research should be conducted to determine how, when, and where preservice teachers are receiving education in working with gifted and talented students. Perhaps honors and advanced placement courses are doing a better job challenging gifted students or those teachers are more familiar working with this population of students. Also, perhaps non-agriculture preservice teachers receive more instruction on working with gifted students in their teacher preparation programs. It is unclear why this is the case, and further research is needed to determine why.

Participants perceived approximately 10% gifted students in their class, ranging from 0% to 75%. This is consistent with the DMGT model, estimating 10% of students are gifted (Gagné, 2010). This is higher than the national percentage of 6.7% and less than the 22% perceived by agriculture teachers in Utah (National Center for Education Statistics, 2018; Overstreet & Straquadine, 2001). The wide range could be attributed to varying definitions and interpretations of what it means to be gifted, as not all schools identify gifted students. For further studies, clarifying a specific form of giftedness in the introduction of the survey instrument, whether intellectual, creative, social, perceptual, muscular, or motor control (Gagné, 2010) could be useful. Developing a universal definition for giftedness within the domain of agriculture, seen within the agriculture classroom, would also be beneficial to the field.

Based on the attitude statements, professional development should not be used to enhance attitudes toward gifted students, as their attitudes are overwhelmingly positive. However, there is evidence that respondents recognize a need for teaching tools; therefore, we recommend efforts to develop teaching tools to better prepare agriculture teachers to teach gifted students. They mostly agree that agricultural education supports gifted learners (92.2% agreement), but less feel agricultural education does a better job meeting needs than other classes in the school (77.4% agreement). What classes are doing a better job and why?

While agriculture teachers in this sample generally did not feel threatened by the intelligence of gifted students, over half were challenged in their content understanding, suggesting that equipping

agriculture teachers with a deeper understanding of the content may be beneficial. This might indicate a need for increased technical agriculture courses that preservice agriculture teachers take or the development of inservice programs in specific subject matter. However, Gagné (2010) identifies pedagogy as an influencer in the talent development process. As a teacher continues to learn about the depths of their subject matter, agriculture teachers can also learn to leverage the knowledge of gifted students in a positive way. Teachers may not need to be the most knowledgeable expert but can utilize pedagogy to leverage students' prior knowledge and encourage deeper study.

Through the Borich needs assessment model, 16 items had positive MWDS, which indicates an opportunity for professional growth. One item related to behavior management received a negative MWDS and does not need professional development. This is in contrast with Berman et al. (2012), who found preservice teachers perceived gifted students as a problem in the classroom, even following professional development.

The top five Borich needs assessment items for professional development were: providing challenging agriculture curriculum for gifted students, differentiating instruction of gifted students in agriculture classes, teaching gifted students problem-solving skills, motivating gifted students in agriculture classes, helping gifted students identify agricultural interests. It is unclear if "teaching gifted students problem solving skills" is directly addressing problem-based learning, or the teacher perception that Altıntas and Ilgun (2016) identified as "Asking too many questions," which may have implications for how agricultural educators are responding to being challenged in their content area. The results differed from needs assessments previously in agricultural education that did not address working with gifted students specifically (Garton & Chung, 1997; Layfield & Dobbins, 2003; Sorensen et al., 2010). This fluctuation could indicate that there are differences in inservice professional development needs when the context involves working with gifted students, as gifted students may pose different needs compared to other student populations. Because this was a national study, perhaps the inservice needs differ more on a national scale when compared to individual state inservice needs. Individual states should determine the needs of their own inservice SBAE teachers and provide professional development accordingly.

The top six mean weighted discrepancy score items were related to working with gifted students in the classroom portion of the three-component model of agricultural education. More specifically, the top four scoring items for ability were related to FFA. Participants perceived themselves as more able to work with gifted students outside of the classroom, in the FFA and on CDE teams, but not as able in the classroom through challenging content, additional content, and differentiated instruction. This could be due to the more individualized nature of the FFA, where teachers are more easily able to differentiate tasks and match students with tasks according to their ability level. Perhaps if FFA is integrated into the classroom curriculum, agriculture teachers could more easily differentiate instruction with students. The non-athletic competitions within the FFA may attract gifted students, as other extra-curricular academic competitions are more directly marketed toward gifted students. Alternatively, gifted students may not be extending their engagement to FFA and SAE, and further research is warranted to determine level of participation.

Providing challenging curriculum and differentiating instruction can relate to the provisions section of the differentiated model of giftedness and talent, which includes enriching curriculum and pedagogy (pacing), as well as administrative grouping and acceleration (Gagné, 2010). Providing challenging curriculum for gifted students was the largest identified need. Teachers need advanced content knowledge to accelerate gifted students beyond what is traditionally covered in the classroom (VanTassel-Baska & Stambaugh, 2005). Differentiating instruction for gifted students in agriculture classes is the second highest need. Differentiation is a teaching tool used with students of all ability levels, including gifted students (Tomlinson, 2014). This would not only aid in teaching gifted students but would improve teaching overall within the SBAE program, by accommodating students of varying

ability and individualizing education within the classroom component.

This study informs teacher educators about in-service and preservice professional development needs, to better meet the needs of gifted agriculture students and ultimately direct more students towards agricultural careers. It is also a starting point for future research regarding CTE teacher attitudes and their professional development needs when teaching gifted students. Teacher induction programs provided by state agriculture teacher associations and university teacher preparation programs should develop inservice programs to help early career teachers develop the necessary skills to work with gifted and talented students in the classroom. We recommend skill development for early career teachers because they have perhaps not had the professional experience to develop such skills. Additionally, groups of experienced agriculture teachers interested in special education that includes gifted students could create lessons plans with associated resources for faculty to implement in methods courses at the university level. In addition to preservice curriculum, these same teachers can produce professional development material for state staff to implement with inservice teachers.

References

Altıntas, E., & Ilgun, S. (2016). The term gifted child from teachers view. *Educational Research and Reviews, 11*(10), 957-965. https://doi.org/10.5897/ERR2016.2762

Aschenbrener, M. S., Garton, B. L., & Ross, A. L. (2010). Early career agriculture teachers' efficacy toward teaching students with special needs. *Journal of Agricultural Education, 51*(4).105-117. https://doi.org/10.5032/jae.2010.04105

Armstrong, R. A. (2014). When to use the Bonferroni correction. *Ophthalmic & Physiological Optics, 34*(5), 502-508. https://doi.org/10.1111/opo.12131

Berman, K. M., Schultz, R. A., & Weber, C. L. (2012). A lack of awareness and emphasis in preservice teacher training: Preconceived beliefs about the gifted and talented. *Gifted Child Today, 35*(1), 18-26. https://doi.org/10.1177/1076217511428307

Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. *Journal of Teacher Education, 31*(3), 39-42. https://doi.org/10.1177/002248718003100310

Caldwell, D. W. (2012). *Educating gifted students in the regular classroom: Efficacy, attitudes, and differentiation of instruction* [Doctoral dissertation, Georgia Southern University.]. https://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=1826&context=etd

Overbay, A, & Broyles, T. W. (2006). Career values and perceptions of agriculture: What these gifted high school students thought. *NACTA Journal*, *52*(2), 2-7. https://www.nactateachers.org/attachments/article/198/Overbay_and_Broyles_June08Journal.pdf

Carman, C. A. (2011). Stereotypes of giftedness in current and future educators. *Journal for the Education of the Gifted, 34*(5), 790-812. https://doi.org/10.1177/0162353211417340

Cochran, W.G. (1977) *Sampling Techniques* (3rd ed). Wiley.

DiBenedetto, C. A., Willis, V. C., & Barrick, R. K. (2018). Needs assessments for school-based agricultural education teachers: A review of literature. *Journal of Agricultural Education, 59*(4), 52-71. https://doi.org/10.5032/jae.2018.04052

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons.

Easterly III, R. G., & Myers, B. E. (2011). Inquiry-based instruction for students with special needs in school based agricultural education. *Journal of Agricultural Education, 52*(2), 36-46. https://doi.org/10.5032/jae.2011.02036

Elbert, C. D. & C. D. Baggett. (2003). Teacher competence for working with disabled students perceived by secondary level agricultural instructors in Pennsylvania. *Journal of Agricultural Education, 44*(1), 105-115. https://doi.org/10.5032/jae.2003.01105

Farkas, S., & Duffett, A. (2008). Results from a national teacher survey. In *High-achieving students in the era of NCLB* (Part 2). https://files.eric.ed.gov/fulltext/ED501703.pdf

Gagné, F. (2000). Understanding the complex choreography of talent development through DMGT-based analysis. In *International handbook of giftedness and talent* (pp. 67-79). Elsevier. https://doi.org/10.1016/B978-008043796-5/50005-X

Gagné, F. (2004). Transforming gifts into talents: The DMGT as a developmental theory. *High Ability Studies*, *15*(2), 119-147. https://doi.org/10.1080/1359813042000314682

Gagné, F. (2010). Motivation within the DMGT 2.0 framework. *High Ability Studies*, *21*(2), 81-99. https://doi.org/10.1080/13598139.2010.525341

Gagné, F., & Nadeau, L. (1991). *Brief presentation of Gagné and Nadeau's attitude scale "Opinions about the gifted and their education"* [Unpublished manuscript, University of Quebec]. https://www.dropbox.com/s/1fqqekgkti1ks6c/gagn%C3%A9%201991%20GagNad%20Attit.PDF?dl=0

Garton, B. L., & Chung, N. (1997). An assessment of the inservice needs of beginning teachers of agriculture using two assessment models. *Journal of Agricultural Education*, *38*(3), 51-58. https://doi.org/10.5032/jae.1997.03051

Geake, J. G., & Gross, M. U. M. (2008). Teachers' negative affect toward academically gifted students: An evolutionary psychological study. *Gifted Child Quarterly, 52*(3), 217-231. https://doi.org/10.1177/0016986208319704

Gentry, M., Hu, S., Peters, S. J., & Rizza, M. (2008). Talented students in an exemplary career and technical education school: A qualitative inquiry. *Gifted Child Quarterly, 52*(3), 183-198. https://doi.org/10.1177/0016986208319300

Gentry, M., Peters, S. J., & Mann, R. L. (2007). Differences between general and talented students' perceptions of their career and technical education experiences compared to their traditional high school experiences. *Journal of Advanced Academics*, *18*(3), 372-401. https://doi.org/10.4219/jaa-2007-496

Goecker, A. D., Smith, E., Fernandez, J. M., Ali, R., & Theller, R. G. (2015). *USDA 2015-2020 employment opportunities - in food, agriculture, renewable natural resources, and the environment*. https://www.purdue.edu/usda/employment/

Gray, E. (2011). *Perspectives of students who are academically or intellectually gifted in agricultural education programs in North Carolina* [Master's thesis, North Carolina State University]. https://repository.lib.ncsu.edu/bitstream/handle/1840.16/6800/etd.pdf?sequence=1

Hansen, J. B., & Feldhusen, J. F. (1994). Comparison of trained and untrained teachers of gifted students. *Gifted Child Quarterly, 38*(3), 115-121. https://doi.org/10.1177/001698629403800304

Higher Education Opportunities Act of 2008, Pub. L. No. 110-315, 122 Stat. 3133 (2008).

Hile, O. M., & Hunsaker, S. L. (2021). Agricultural education and the theoretical work of Dr. Joseph Renzilli: An organic relationship. *NACTA Journal, 65*, 382-387.

Israel, G. D., Myers, B. E., Lamm, A. J., & Galindo-Gonzalez, S. (2012). CTE students and science achievement: Does type of coursework and occupational cluster matter? *Career and Technical Education Research*, *37*(1), 3-20. https://doi.org/10.5328/cter37.1.3

Johnson, L., Wilson, E., Flowers, J., & Croom, B. (2012). Perceptions of North Carolina high school agricultural educators regarding students with special needs participating in supervised agricultural experience and FFA activities. *Journal of Agricultural Education, 53*(4).41-54. https://doi.org/10.5032/jae.2012.04041

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Layfield, K. D., & Dobbins, T. R. (2003). Inservice needs and perceived competencies of South Carolina agricultural educators. *Journal of Agricultural Education, 43*(4), 46-55. https://doi.org/10.5032/jae.2002.04046

Lindner, J. R., Murphy, T. H., & Briers, G. E. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education, 42*(4), 43-53. https://doi.org/10.5032/jae.2001.04043

Marland, S. P., Jr. (1971). *Education of the gifted and talented - volume I: Report to the congress of the United States by the U.S. commissioner of education.* https://files.eric.ed.gov/fulltext/ED056243.pdf

McKim, B. R., & Saucier, P. R. (2011). An excel-based mean weighted discrepancy score calculator. *Journal of 4-H Extension, 49*(2). https://joe.org/joe/2011april/tt8.php

Megay-Nespoli, K. (2001). Beliefs and attitudes of novice teachers regarding instruction of academically talented learners. *Roeper Review, 23*(3), 178-182. https://doi.org/10.1080/02783190109554092

Mullet, D. R., Kettler, T., & Sabatini, A. (2018). Gifted students' conceptions of their high school STEM education. *Journal for the Education of the Gifted, 41*(1), 60-92. https://doi.org/10.1177/0162353217745156

National Center for Education Statistics. (2018). *Percentage of public-school students enrolled in gifted and talented programs, by sex, race/ethnicity, and state: Selected years, 2004 through 2013-14.* https://nces.ed.gov/ programs/digest/d17/tables/dt17_204.90.asp

National FFA Organization (2018). *Official FFA manual.* https://ffa.app.box.com/v/Library/file/322688888769

National FFA Organization (2019a). *Agricultural education*. https://www.ffa.org/agricultural-education/

National FFA Organization (2019b). *Our membership*. https://www.ffa.org/our-membership/

Overstreet, M., & Straquadine, G. S. (2001). *An examination of a high school horticulture curriculum process designed for diverse student learning styles.* http://www.agedweb.org/WRAEC/2002/Research%20Papers/ Overstreet-Straquadine.pdf

Pandya, H. S., & Curtis, S. M. (1981, December). *Status of gifted students in vocational agriculture classes in the United States*. Paper presented at the Annual Convention of the American Vocational Association, Atlanta, GA.

Pense, S. L. (2009). Curricular needs of students with specific learning disabilities in Illinois secondary agricultural education programs. *Journal of Agricultural Education, 50*(2), 87-99. https://doi.org/10.5032/jae.2009.02087

Pense, S. L., Watson, D. G., & Wakefield, D. B. (2010). Learning disabled student needs met through curriculum redesign of the Illinois agricultural education core curriculum. *Journal of Agricultural Education, 51*(2). 115-126. https://doi.org/10.5032/jae.2010.02115

Plucker, J., Giancola, J., Healey, G., Arndt, D., & Wang, C. (2015). *Equal talents, unequal opportunities: A report card on state support for academically talented low-income students*. https://files.eric.ed.gov/fulltext/ ED569953.pdf

Roberts, L. D., & Allen, P. J. (2015). Exploring ethical issues associated with using online surveys in

educational research. *Educational Research and Evaluation, 21*(2), 95-108. https://doi.org/10.1080/13803611.2015.1024421

Roberts, T. G., Dooley, K. E., Harlin, J. F., & Murphrey, T. P. (2007). Competencies and traits of successful agricultural science teachers. *Journal of Career and Technical Education, 22*(2). https://doi.org/10.21061/jcte.v22i2.429

Saleh, A., & Bista, K. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Online Submission, 13*(2), 63-74. https://files.eric.ed.gov/fulltext/ED596616.pdf

Shih, T.-H., & Fan, X. (2008). Comparing response rates from web and mail surveys: A meta-analysis. *Field Methods, 20*, 249–271. https://doi.org/10.1177/1525822X08317085

Smith, K. L., & Rayfield, J. (2019). STEM knowledge, learning disabilities and experiential learning: Influences of sequencing instruction. *Journal of Agricultural Education, 60*(2), 222-236. https://doi.org/10.5032/jae.2019/02222

Sorensen, T. J., Tarpley, R. S., & Warnick, B. K. (2010). Inservice needs of Utah agriculture teachers. *Journal of Agricultural Education, 51*(3), 1-11. https://doi.org/10. 5032/jae.2010.03001

Stripling, C. T., & Ricketts, J. C. (2016). Research priority 3: Sufficient scientific and professional workforce that addresses the challenges of the 21st century. In *American Association for Agricultural Education national research agenda: 2016-2020* (pp. 29-35). Department of Agricultural Education and Communication. http://aaaeonline.org/resources/Documents/AAAE_National_Research_Agenda_2016-2020.pdf

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners* (2nd ed.). Association for Supervision and Curriculum Development.

Tomlinson, C. A., Tomchin, E. M., & Callahan, C. M. (1994, April). *Preservice teachers' perceptions and responses to the differential needs of gifted students in their classrooms.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA. https://files.eric.ed.gov/fulltext/ED372060.pdf

Tomlinson, C. A., Callahan, C. M., Moon, E. M., Landrum, M., Imbeau, M., Hunskaer, S. L., & Eliss, N. (1995). *Preservice teacher preparation in meeting the needs of gifted and other academically diverse students.* National Research Center on the Gifted and Talented. https://files.eric.ed.gov/fulltext/ED429392.pdf

Touchstone, A. J. L. (2015). Professional development needs of beginning agricultural education teachers in Idaho. *Journal of Agricultural Education, 56*(2), 170-187. https://doi.org/10.5032/jae.2015.02170

VanTassel-Baska, J., & Hubbard, G. F. (2016). Classroom-based strategies for advanced learners in rural settings. *Journal of Advanced Academics, 27*(4), 285-310. https://doi.org/10.1177/1932202X16657645

VanTassel-Baska, J., & Stambaugh, T. (2005). Challenges and possibilities for serving gifted learners in the regular classroom. *Theory into Practice, 44*(3), 211-217. https://doi.org/10.1207/s15430421tip4403_5

Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions* (2nd ed.). Venture Publishing.