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Examining the Common Core State Standards in Agricultural Education

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Abstract

The Common Core State Standards (CCSS) represent a shift in the American education system. Included in the CCSS are opportunities for agriculture teachers to integrate math and English language arts content into their curriculum. Using the theory of planned behavior, we sought to identify Oregon agriculture teachers' attitudes, familiarity with, current level of integration, and professional development needs related to the Common Core State Standards. Our research identified the majority of responding teachers were somewhat familiar with the CCSS. Additionally, teachers had varying levels of agreement that the CCSS would help their teaching, yet the majority of agriculture teachers in our study reported they had somewhat implemented the CCSS. In an effort to identify the professional development needs of teachers concerning these standards, we used the CCSS to develop 11 needs assessment competencies related to math, reading, and writing. Respondents identified the highest professional development need areas in topics related to developing students' abilities to write and do mathematics problems in the context of agriculture. These findings are discussed using the theory of planned behavior; recommendations for practice and future research are also highlighted.

Keywords: common core, academic standards, academic integration, math, reading, writing

Introduction and Theoretical Framework

The American education system faces a monumental challenge; high school graduates have been labeled as unprepared for both postsecondary schooling and workforce employment (Eisen, Jasinowski, & Kleinert, 2005; Wirt et al., 2004). In an effort to remedy this dilemma, a collaborative team representing educators, researchers, community members, and national organizations worked to develop the Common Core State Standards (CCSS; Kendall, 2011). The CCSS are a rigorous set of academic benchmarks for K-12 students in the areas of English language arts (ELA) and mathematics (Common Core State Standards Initiative, 2010a; Common Core State Standards Initiative, 2010b; Kendall, 2011; Rothman, 2011). The release of the CCSS in 2010 represented a significant shift in the landscape of American education (Porter, McMaken, Hwang, & Yang, 2011; Rothman, 2011). The establishment of the CCSS sought to accomplish three important criteria: homogenize academic standards across states, hold American students to

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the same high academic standards as students in academically exceptional countries, and prepare students to be successful in postsecondary education and a global workforce (Kendall, 2011).

As of 2013, 44 states had adopted the CCSS (Achieve, 2013). Those states that had not adopted the CCSS included Alaska, Nebraska, North Carolina, and Texas. Indiana had previously adopted the standards, but opted out in 2014. Minnesota had adopted the English language arts standards, but had not adopted the mathematics standards (Achieve, 2013). Within each of the 44 adopting states a unique timeline for adoption was established, with some states fully implementing the CCSS as early as the 2011-2012 school year and other states fully implementing the standards during the 2014-2015 school year, with the latter group including Oregon, in which this research was conducted (Achieve, 2013).

One important consideration, especially for the agricultural education profession, is the implementation of the CCSS in subject areas other than math and ELA. The mathematics CCSS are written to guide the development of students' mathematics skills within typical math subject areas (Common Core State Standards Initiative, 2010b). However, included in the mathematics CCSS are standards for mathematical practice, which "describe varieties of expertise that mathematics educators at all levels should seek to develop in their students" (Common Core State Standards Initiative, 2010b, p. 6). Disciplines like agricultural education, which include mathematics principles in their curriculum (Stripling, Roberts, & Stephens, 2014), may consider the adoption of these standards to help inform their integrated teaching (Meeder & Suddreth, 2012; Pearson et al., 2010). The ELA CCSS take a more direct route to guide the teaching of ELA content outside of traditional ELA classrooms. Included in the ELA CCSS are specific reading and writing competencies for science and technical subjects (Common Core State Standards Initiative, 2010a).

Research highlights career and technical education as a viable context for increasing students' knowledge in math and ELA (Pearson et al., 2010). Furthermore, agricultural education has been identified as an applicable context for the integration of traditional core academic content (Edwards & Ramsey, 2004; Myers & Dyer, 2004; Nolin & Parr, 2013; Phipps, Osborne, Dyer, & Ball, 2008). The effectiveness of agricultural education as a method for developing students' math and ELA skills can be found in a 2013 study conducted by Nolin and Parr. This research identified a positive relationship between the number of agriculture courses students had taken and their mathematics and ELA scores on a standardized exam. Furthermore, a pair of studies identified career and technical education teachers who intentionally integrated core academic subject matter into their curriculum were more effective in developing the math (Pearson et al., 2010) and ELA (Park, 2012) skills of their students. These studies highlight the importance of the teacher's decision to integrate traditional core academic content in building the math and ELA skills of their students.

While research identifies the importance of the agriculture teacher in the success of their students learning math and ELA content, there exists a dearth of studies in agricultural education exploring agriculture teachers' perceptions of math and ELA integration, even outside the context of the CCSS (Park & Osborne, 2006). Although agricultural education teachers' attitudes toward the CCSS have not previously been explored, research outside of agricultural education has investigated the topic. A 2013 study conducted by the Editorial Projects in Education Research Center [EPE] sought to describe practicing teachers' familiarity with, attitudes toward, implementation of, and preparedness to teach the CCSS. This study identified that 78% of responding teachers were familiar with the mathematics standards and 92% of teachers were familiar with the ELA standards. Although teachers were familiar with the standards, they had not participated in an abundance of professional development experiences related to the CCSS. Nearly one-third of respondents in this study reported spending one day or less in professional development related to the implementation of the CCSS. Furthermore, the majority of responding teachers, 56%, identified the curriculum they were using was not aligned with the CCSS. Overall, teachers in the EPE study felt ill-prepared to teach the CCSS, especially to English-language

learners and students with learning disabilities. However, 76% of teachers in the study remained optimistic that the implementation of the CCSS would improve their teaching strategies, and 87% of teachers reported they had already partially or fully implemented the CCSS into their teaching (EPE, 2013).

The goal of this study was to explore Oregon agriculture teachers' attitudes toward math and ELA integration through the CCSS. The theoretical foundation for this investigation was the theory of planned behavior (Ajzen, 1991). The theory of planned behavior is commonly used to understand human behavior. Within agricultural education, the theory of planned behavior has been used to explore the attitudes and beliefs of principals (Kalme & Dyer, 2000), counselors (Thompson Jr. & Russell, 1993), parents (Osborne & Dyer, 2000; Thompson Jr. & Russell, 1993) and students (Osborne & Dyer, 2000; Thompson Jr. & Russell, 1993) toward agricultural education. Additionally, researchers in agricultural education have used the theory of planned behavior to explore preservice teachers' perceptions of barriers to integrating science in their classroom (Thoron & Myers, 2010).

The theory of planned behavior was developed from the theory of reasoned action (Ajzen & Fishbein, 1980). One primary difference separates the two theories. The theory of planned behavior includes perceived behavioral controls as a predictor of behavior intention and behavior (Ajzen, 1991). In addition to perceived behavioral controls, this theory identifies two other determinants to an individual's intention to behave a certain way: attitude toward behavior and subjective norms (see Figure 1; Ajzen, 1991). Ajzen defines an individuals' attitude toward the behavior as "the degree to which a person has a favorable evaluation or appraisal of the behavior in question" (1991, p. 188). The second predictor of behavioral intention, subjective norms, refers to the pressure to behave a certain way established by members of society. The final predictor of behavioral intention, as identified by Ajzen, is perceived behavioral control. This is an individual's perception of the barriers to executing a certain behavior. Perceived behavioral control can reflect negative consequences of past behavior or roadblocks anticipated when considering new behaviors.

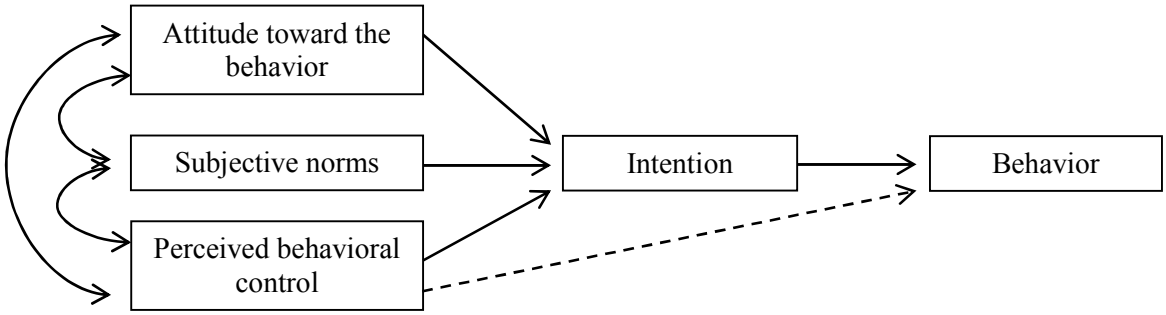

Figure 1. Theory of planned behavior (Ajzen, 1991).

Our study was conducted among Oregon agriculture teachers; all teachers in Oregon were expected to begin implementation of the CCSS during the 2014-2015 school year (Achieve, 2013). Our study sought to explore these agriculture teachers' attitudes toward the implementation of the CCSS in their curriculum. By exploring agriculture teachers' attitudes toward the CCSS, we sought to provide evidence of teachers' behavioral intentions concerning the implementation of the CCSS during the 2014-2015 school year. Additionally, we sought to describe teachers' current level of CCSS integration in their curriculum as well as the professional development needs agriculture teachers identified related to ensuring students' success in meeting rigorous mathematics and ELA standards.

Purpose and Objectives

The purpose of this research was to describe Oregon agriculture teachers' attitudes, familiarity, level of implementation, and professional development needs related to the CCSS. With the impetus of the CCSS being to develop high school graduates' preparedness for postsecondary education and a global workforce (Kendall, 2011), research into agricultural education teachers' perceptions related to implementation of these standards addresses National Research Agenda priority 3, "Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21st Century" (Doerfert, 2011, p. 9). In order to accomplish the purpose of this research, four objectives were developed. These research objectives were:

1. Describe agriculture teachers' familiarity with the CCSS;
2. Describe agriculture teachers' attitudes toward the CCSS;
3. Describe agriculture teachers' reported incorporation of the CCSS in their teaching; and
4. Describe agriculture teachers' perceived professional development needs related to teaching the reading, writing, and math CCSS.

Methods

The target population for this study included all school-based agriculture teachers in Oregon (N = 111) during the 2013-2014 school year, a year prior to statewide implementation of the CCSS. We obtained the names and contact information of agriculture teachers using the 2013-2014 Oregon agriculture teacher directory. A panel of experts in the field of agricultural education vetted the information in the directory to ensure its accuracy. Inasmuch as we attempted a census, we made no attempt to generalize the findings beyond the population of teachers in Oregon during the 2013-2014 school year.

The questionnaire was composed of three parts: perspectives about the CCSS, CCSS professional development needs, and teachers' demographic information. Perspectives about the CCSS were assessed by a modified version of the National Survey of Teacher Perspectives on the Common Core survey instrument (EPE, 2013). This instrument was designed to identify teachers' familiarity with, attitude toward, and current incorporation level of the CCSS. The second portion of the questionnaire, the CCSS needs assessment, was developed by the researchers. This needs assessment was developed based on the Borich (1980) needs assessment model to assess the perceived ability and importance for a total of 11 competencies related to math and ELA integration in agricultural education as prescribed by the CCSS. In order to accomplish this, the 28 CCSS relevant to agricultural educators were pared down to 11 succinctly written items. This step was critical to increase response rate by reducing respondent burden.

Individual needs assessment items for the ELA portion of the CCSS needs assessment were developed using the CCSS in writing and reading for science and technical subjects (Common Core State Standards Initiative, 2010a). Both the ELA reading and writing components of the CCSS include ten standards grouped into four larger themes. These larger themes were analyzed by the researchers, and one needs assessment item was developed based upon the combination of standards within the different themes. For example, one theme within the ELA reading CCSS is *Key Ideas and Details*, the CCSS needs assessment item we developed from this theme stated: "Develop students' ability to identify the central idea as well as details when reading Agricultural Science and Technology (AST) texts."

Individual items for the mathematics portion of the CCSS needs assessment were developed for agriculture teachers using the eight standards for mathematical practice found in the CCSS (Common Core State Standards Initiative, 2010b). The eight standards for mathematical practice were combined into three themes by the researchers. From these three

themes, individual items were developed for the CCSS needs assessment. For example, the theme "problem solving" was constructed from the following objectives: make sense of problems and persevere in solving them, use appropriate tools strategically, and attend to precision when solving problems. Once the eight mathematics standards were categorized into three groups, we developed an individual needs assessment item that reflected the purpose of the standards in each group. For the problem solving theme, the following item was developed: "Develop students' ability to correctly solve AST-related math problems."

The final CCSS needs assessment included 11 items that were categorized into three subscales: "Reading" (four items), "Writing" (four items), and "Mathematics" (three items). Teachers were asked to rate their perceived importance and perceived ability for each of the 11 competencies using a five-point Likert-type scale ranging from 1 "Very Low" to 5 "Very High." A panel of experts in the field of agricultural education established face and content validity for the instrument. A post-hoc reliability analysis revealed the Reading (Cronbach's alpha = .84), Writing (Cronbach's alpha = .91), and Mathematics (Cronbach's alpha = .95) subscales had acceptable reliability.

We administered the survey instrument and collected data in December of 2013, approximately nine months prior to full implementation of the CCSS in Oregon. The survey was administered through the online program Qualtrics. We made five points of contact with participants to elicit responses (Dillman, 2000). The first point of contact was a notification e-mail, the three subsequent points of contact were e-mails requesting participation in the research study. The final point of contact was a phone call to individuals who had not yet responded. A total of 80 useable responses were completed, yielding a 72% response rate. An independent samples *t*-test was used to check for non-response error by comparing participants who responded after the final two points of contact (late respondents; $n = 31$) and those who responded prior to the final two points of contact (on-time respondents; $n = 49$) (Lindner, Murphy, & Briers, 2001; Miller & Smith, 1983). We found no statistical differences between on-time and late respondents for items within the perceptions of the CCSS and the perceived CCSS needs. Therefore, we considered non-response error to be insignificant to this study (Lindner et al., 2001; Miller & Smith, 1983).

We analyzed the data using the Statistical Package for the Social Sciences (SPSS) version 20. The first three objectives were descriptive in nature; therefore, we reported the results as frequencies and percentages. To accomplish research objective four, we calculated mean weighted discrepancy scores (MWDS) for each of the 11 CCSS competencies among responding teachers. First, a discrepancy score was calculated for each teacher by subtracting their perceived ability score from their perceived importance score for each item. Then, a weighted discrepancy score was calculated by multiplying their discrepancy score by the mean importance rating for each competency. Finally, the MWDS was calculated by taking the sum of the weighted discrepancy scores across respondents and dividing by the number of respondents. The MWDS were ranked in order to identify the top in-service need for the different CCSS competencies.

Findings

Respondents to this questionnaire had, on average, 11 years of teaching experience. The largest proportion of teachers identified themselves as first year agriculture teachers (11%). A total of 27 teachers (36%) identified that they were in their first five years of teaching agriculture. Just over half the respondents (53%) were male. Eighty percent of the responding teachers identified attending a traditional agriculture teacher training program. The majority of respondents (52%) indicated they were certified to teach the CASE curriculum, with the most common CASE certifications being in Plant Science and Agriculture, Food and Natural Resources (AFNR). Respondents indicated teaching a wide variety of agricultural education

content, with the most common classes taught being introductory classes in agricultural education, Plant Sciences, Animal Sciences, and Food Science.

The first objective of this study sought to describe agriculture teachers' familiarity with the CCSS (see Table 1). The majority of teachers reported being somewhat familiar with the CCSS for both ELA (63.29%) and Mathematics (60.76%). There were 10 (12.66%) teachers who indicated they were not familiar with the ELA CCSS and 16 (20.25%) teachers who indicated they were not familiar with the math standards. Alternatively, 19 (24.05%) teachers identified themselves as being very familiar with the ELA CCSS. A lower number of teachers (f = 15; 18.99%) identified being very familiar with the mathematics CCSS.

Table 1

Oregon Agriculture Teachers' Level of Familiarity with the CCSS

	Not familiar		Somewhat familiar		Very familiar	
Item	*f*	%	*f*	%	*f*	%
Level of familiarity with English Language Arts CCSS.	10	12.66	50	63.29	19	24.05
Level of familiarity with the Mathematics CCSS.	16	20.25	48	60.76	15	18.99

For objective two, we sought to describe agriculture teachers' perceptions of the CCSS (see Table 2). Half of the responding teachers (f = 39; 50.00%) indicated they slightly agreed that the CCSS would help improve their instructional practices while another 25.64% (f = 20) indicated they strongly agreed with this statement. The last one-quarter of teachers disagreed with the statement that the CCSS would improve their teaching, or indicated they did not know.

When asked whether they had received adequate training around the CCSS, teachers were almost evenly split between slightly agree (f = 29) and slightly disagree (f = 27) with another 11 teachers indicating they strongly agreed and strongly disagreed they had received adequate training. A majority (62%) of teachers slightly (f = 30) or strongly (f = 19) agreed their curriculum materials were aligned with the CCSS. A majority of teachers also slightly (f = 31) or strongly agreed (f = 15) they were prepared to teach the CCSS in their classrooms, while more than a third of Oregon agriculture teachers disagreed slightly (29.11%) or strongly (12.65%) they were prepared to teach the CCSS.

Table 2

Oregon Agriculture Teachers' Perceptions of the CCSS

	Strongly disagree		Slightly disagree		Slightly agree		Strongly agree		Don't know	
Question	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
In general, the CCSS will help me improve my own instruction and classroom practices.	3	3.84	10	12.82	39	50.00	20	25.64	6	7.69
I have received adequate training/ professional development related to the CCSS.	11	13.92	27	34.18	29	36.71	11	13.92	1	1.27
My curriculum materials are aligned with the CCSS.	4	5.06	21	26.58	30	37.97	19	24.05	5	6.33
I feel prepared to teach the CCSS to my students.	10	12.65	23	29.11	31	39.24	15	18.99	0	0.00

Objective three sought to describe agriculture teachers' incorporation of the CCSS into their teaching (see Table 3). A large majority (*f* = 65; 82.28%) of Oregon agriculture teachers reported they had incorporated the CCSS into some areas of their teaching, but not others. Six teachers (7.59%) reported no incorporation of the CCSS into their teaching and an equal number (*f* = 6; 7.59%) indicated they did not know to what extent the CCSS were incorporated into their practice. There were only two teachers (2.53%), at the point of data collection, who reported full incorporation of the CCSS in their teaching.

Table 3

Oregon Agriculture Teachers Incorporation of the CCSS

	Fully incorporated into all areas of my teaching		Incorporated into some areas of my teaching, but not others		Not at all incorporated into my teaching		I don't know	
Response	*f*	%	*f*	%	*f*	%	*f*	%
Incorporation of the CCSS into teaching practice.	2	2.53	65	82.28	6	7.59	6	7.59

Objective four sought to describe agriculture teachers' perceived professional development needs related to teaching the CCSS. The areas of highest need were identified through a combination of perceived importance and competence using mean weighted discrepancy scores (MWDS). We grouped the items into tables by CCSS areas (i.e. reading, writing, and math), individual items are reported from highest perceived need for professional development to the lowest.

As it relates to CCSS for reading, we found the highest perceived need for professional development was helping students identify the central idea and details when reading an Agricultural Science and Technology (AST) text. Even though this was the largest perceived need in reading, the MWDS was not high (MWDS = 1.86) when compared to the perceived needs in math and writing (see Table 4). The lowest need in the area of reading was developing students' ability to identify the relationships between commonly used AST terms (MWDS = 1.00).

Table 4

Agriculture Teachers' Perceived Professional Development Needs Teaching the CCSS in Reading

Reading Standard	MWDS
Develop students' ability to...	
Identify the central idea as well as details when reading AST texts.	1.86
Critically analyze information from a variety of sources.	1.82
Comprehend grade specific AST texts.	1.41
Identify the relationships between commonly used AST terms.	1.00

Note. AST = Agricultural Science and Technology.

As it relates to training in the CCSS writing standards, the highest need for teacher professional development was in developing students' ability to present knowledge through research projects (MWDS = 2.47) (see Table 5). The lowest need, related to the CCSS writing standards, was developing students' ability to write AST specific content in a variety of forms (MWDS = 2.19).

Table 5

Agriculture Teachers' Perceived Professional Development Needs Teaching the CCSS in Writing

Writing Standard	MWDS
Develop students' ability to...	
Present knowledge through research projects in AST.	2.47
Engage in a variety of writing exercises in AST.	2.34
Produce quality writings related to AST.	2.20
Write AST specific content in a variety of forms.	2.19

Note. AST = Agricultural Science and Technology.

Lastly, teachers were asked about the competence and importance related to the CCSS in mathematics (see Table 6). The highest need for professional development was in developing students' ability to identify the most efficient method for solving math problems in agriculture (MWDS = 2.64), this was also identified as the highest perceived need throughout the CCSS needs assessment. The lowest identified need in mathematics was in developing students' ability to correctly solve AST related math problems (MWDS = 2.01).

Table 6

Agriculture Teachers' Perceived Professional Development Needs Teaching the CCSS in Mathematics

Mathematics Standard	MWDS
Develop students' ability to...	
Identify the most efficient method for solving math problems in agriculture.	2.64
Construct viable arguments using mathematics.	2.43
Correctly solve AST related math problems.	2.01

Note. AST = Agricultural Science and Technology.

Conclusions, Implications and Recommendations

The CCSS in ELA and mathematics represent an effort to increase the achievement of students throughout the American education system. Our research sought to explore Oregon agriculture teachers' attitudes, current integration level, and professional development needs related to the CCSS. Research objective one examined teachers' familiarity with the CCSS. Results revealed a majority of teachers were familiar with both the ELA and mathematics CCSS. However, 20% of the respondents indicated they were not familiar with the CCSS in math and 13% indicated no familiarity with CCSS in ELA. While the CCSS are new, it is nevertheless disconcerting that there are agriculture teachers with no familiarity with these standards. As a discipline, agricultural education is often touted as a subject area that integrates traditional core subjects. If the goal of the CCSS is that all teachers integrate these standards in their classroom, the first step is all teachers must become familiar with the standards.

While objective one examined familiarity, objective two examined teachers' perceptions of the CCSS. Specifically, we sought to identify the extent to which agriculture teachers felt the CCSS would help improve their teaching. Overall, 76% of respondents agreed the CCSS would improve their teaching. Looking at the theory of planned behavior, attitude toward the behavior is a critical predictor of intention and behavior (Ajzen, 1991). Our results indicate the majority of teachers held a positive attitude about the incorporation of the CCSS into their teaching, a positive sign for full implementation of these standards. However, when considering preparedness to teach the CCSSS, approximately half the responding teachers (47%) indicated a need for additional training.

As schools look to implement the CCSS, school-based trainings may only target teachers of core subject areas. This may create a void in training, leaving agriculture teachers with few opportunities to explore the implementation of the CCSS. We recommend agriculture teacher educators fill this potential void by becoming familiar with and incorporating the CCSS into teacher preparation and in-service programs. This may help to address the current lack of CCSS professional development for practicing teachers. Based on the rate at which different states embrace the CCSS, future research should explore whether agricultural teachers are adequately

trained to implement the CCSS and support the learning and testing associated with these standards.

Agriculture teachers indicated, in objective three, they do incorporate some areas of CCSS into their teaching practice. While this is encouraging, responding teachers also identified specific professional development need areas in objective four. Agriculture teachers indicated having lesser need in the areas of integrating reading and greater needs in the areas of writing and math integration. Overall, the greatest need areas were in developing students' ability to identify the most efficient method for solving math problems in agriculture, developing students' ability to present knowledge through research projects in agriculture science and technology, and developing students' ability to construct viable arguments using mathematics.

Our research suggests consideration should be given to the development of initial professional development opportunities related to math and ELA integration to ensure all teachers have an adequate understanding of the CCSS. Additionally, research should be conducted to determine professional development experiences that relate to an increase in teachers' perceptions of mathematics and ELA integration through the CCSS. We also acknowledge the dearth of available research examining agriculture teachers' perceptions related to the integration of math and ELA concepts. We recommend future research exploring agriculture teachers' perceptions, perhaps outside of the context of the CCSS, especially given the links between attitude toward behavior, behavioral intention (Ajzen, 1991), level of academic integration, and student success (Nolin & Parr, 2013; Park, 2012).

Given that research supports agricultural education as an effective context for the integration of math and ELA skills (Nolin & Parr, 2013; Park, 2012; Pearson et al., 2010); professional development opportunities related to the integration of these subject areas is warranted. Teachers are indicating a need, which agricultural teacher educators can fill through targeted workshops and in-service opportunities on mathematics and ELA skill integration. The theory of planned behavior identifies a link between attitudes and behavior (Ajzen, 1991), therefore as the CCSS were fully implemented in Oregon during the 2014-2015 school year, efforts must be made to provide professional development experiences that ensure all teachers understand the CCSS and how agricultural education can play a positive role in developing the mathematics and ELA knowledge of students. As a result of increased professional development, teachers may be better positioned to strengthen the skill sets of students and to advocate for the relevance of their program as a collaborating partner with the core academic subjects.

As this research indicates, Oregon agriculture teachers have a basic understanding and positive perception regarding the CCSS; however, this study also identified agriculture teachers may lack the tools and training to effectively teach to the CCSS. While the staying power of the CCSS has yet to be determined, it does present agricultural education with yet another opportunity to promote the relevance and importance of our discipline. As we look to the future and explore possibilities for enhancing agricultural education, the ability of our programs to support the curricular core subject areas and enhance test scores may be vital to our continued growth.

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