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Agricultural Science Teachers' Attitudes About and Use of Reading in Secondary Agricultural Science Instruction

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Abstract

A national survey of 216 agriscience teachers investigated the attitudes and practices related to reading. Knowledge of strategies, total time of text use, confidence in strategy use, and the general approach to reading explained 67% of the variance in frequency of content area reading strategy use. Teachers held positive attitudes about reading from personal and instructional standpoints. However, they lacked knowledge and confidence in content area reading strategies, which translated into low frequency of strategy use. Teachers appeared to use reading and text with justifiable frequency in their agricultural science courses. Because knowledge of reading strategies explained such a large amount of variance (nearly 64%) in frequency of reading strategy use, career and technical education program administrators and teacher educators should encourage professional development about reading strategies.

Introduction

Because today's students will read and write more than any other previous generations of students, they must learn the requisite skills necessary to create meaning from the surfeit and diversity of texts available (Moore, Bean, Birdyshaw, & Rycik, 1999; Vacca, 2002). Yet, students continue to perform poorly on literacy assessments (Snow, 2002). The American educational system has made little to no progress with respect to improving students' reading and comprehension over the past twenty years; more than 25% of high school students graduate without the ability to read at the basic level (National Center for Educational Statistics [NCES], 2001).

Learning to create meaning from texts begins in the classrooms, especially early in a student's formal education. It does not cease with advancing grades. Rather, with the increasingly rigorous texts that students encounter, instruction in reading, comprehension, and literacy also should increase throughout high school. This instruction must occur in all courses with responsibility falling upon all

teachers, including career and technical education teachers (Readence, Bean, & Baldwin, 1998; Vacca, 2002).

Increasingly, content area teachers, including agricultural science teachers, are being called upon to enhance student achievement in math, science, and reading (Belcher, McCaslin, & Headley, 1996; Conroy & Walker, 2000). One method of enhancing achievement in reading could be the implementation of content area reading strategies. Content area reading strategies are operationally defined as those text-based strategies that enable students to acquire new content in a given discipline (McKenna & Robinson, 1990). However, few content area teachers employ content area reading strategies (Barry, 2002; Durkin, 1978), for a variety of reasons, including a perceived lack of confidence in their use and an aversion to reading themselves (Park & Osborne, 2006). What are the factors associated with teachers' attitudes toward reading in general and for applications in agricultural science? What factors are associated with their knowledge of content area reading strategies and frequencies of text and strategy use in agricultural science education?

Theoretical and Conceptual Framework

The RAND Reading Study Group ([RRSG]; Snow, 2002) developed a research agenda for research on comprehension that provided the theoretical framework for this study. The RRSG defined reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (p. xiii), which is comprised of three elements: reader, text, and activity or purpose for reading, all occurring in a larger sociocultural context, including the teacher (see Figure 1).

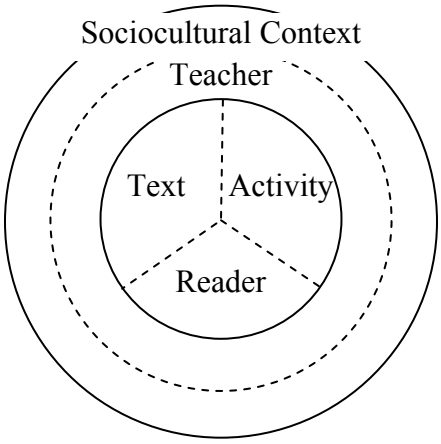

Figure 1. A heuristic for thinking about reading comprehension (Snow, 2002).

The reader brings his or her cognitive capabilities, motivation, knowledge, and experiences to the reading processes (Snow, 2002). These characteristics vary from reader to reader and significantly impact the understanding of written material. Within career and technical education (CTE), students entering these courses possess a wide range of cognitive capabilities, ranging from the most capable students to those who need extra assistance in order to learn from texts. Career and technical education students also enter specific courses with varying levels of motivation, background knowledge, and experiences.

The text includes the representation of information, including the surface code, text base, and mental models. Each different text varies in readability, vocabulary, structure, and content, thereby, impacting comprehension. Texts in CTE areas, such as agricultural science education, can include textbooks, online information, technical manuals, chemical labels, United States Department of Agriculture Extension publications, trade magazines, and trade books. Each of these provides different information in different formats. For students who struggle with reading, the variety of texts in CTE courses may challenge their abilities to learn unless appropriate strategies are employed.

The activity for reading involves the purposes, operations of reading, and outcomes of the reading comprehension processes. Outcomes can consist of solving problems, increasing knowledge, or engaging the reader. In agricultural science education, teachers may challenge students to solve plant growth problems in a greenhouse, to develop solutions for improving the nutrition of livestock, or to create a design for a school landscaping project. Each of these outcomes may involve the use of texts as sources of ideas and information. What teachers expect of the outcomes of reading influences how students read and employ strategies to accomplish those ends.

The context of reading comprehension is comprised of the larger sociocultural environment in which the student encounters and navigates reading (Snow, 2002). This sociocultural context includes the teacher, but also extends beyond the classroom to encompass the community and world of the student. It involves the social aspects of constructing meaning and the development of power within society. When students work collaboratively in the CTE classroom, they are engaging with texts within the sociocultural aspects of their classroom and societal environment. For example, in agricultural science education, students reading a trade magazine may encounter specific biases toward or against agricultural practices. Learning to identify these sociocultural influences is critical to comprehending texts in CTE.

Instruction with Content Area Reading Strategies

Conceptually and practically, comprehension strategies are "procedures that guide students as they attempt to read and write" (National Reading Panel [NRP], 2000, pp. 4-40). CTE teachers employ reading strategies to help students learn when they use texts to gather and complete information to solve problems. These strategies

are "procedural, purposeful, effortful, willful, essential, and facilitative in nature" (Jetton & Alexander, 2001, ¶ 17). Highlighting a set of instructional strategies called *Reading Apprentice*, Schoenbach, Braunger, Greenleaf, and Litman (2003) suggested that effective strategies focus on "*how we read* and *why we read in the ways we do*" (p. 134). In CTE, this translates into reading different genre of texts using different strategies and helping students understand the purposes for reading in a specific way.

Students who are not explicitly taught reading strategies are unlikely to learn, develop, and employ strategies spontaneously (NRP, 2000). Reading strategy instruction requires a shift from didactic instruction to one that is more student-centered (Sinatra, 2000). The explicitness of strategy instruction has a positive effect on student comprehension, especially for low-achieving students (Snow, 2002). "Explicit instruction provides a clear explanation of the criterion task, encourages students to pay attention, activates prior knowledge, breaks the task into small steps, provides sufficient practice at every step, and incorporates teacher feedback" (p. 33).

In a meta-analysis of reading comprehension strategies, the NRP (2000) found eight strategies to be research-based. These comprehension strategies improve student recall, question answering and generation, and summarization of texts. When these general strategies are used by students, they show general gains on standardized comprehension tests. The eight strategies include:

1. *Comprehension monitoring* in which the reader learns how to be aware or conscious of his or her understanding during reading and learns procedures to deal with problems in understanding as they arise
2. *Cooperative learning* in which readers work together to learn strategies within context
3. *Graphic and semantic organizers* that allow the reader to represent graphically (write or draw) the meanings and relationships of the ideas that underlie the words in the text
4. *Story structure* from which the reader learns to ask and answer who, what, where, when, and why questions about the plot and, in some cases, maps out the timeline, characters, and events in stories
5. *Question answering* in which the reader answers questions posed by the teacher and is given feedback on the correctness
6. *Question generation* in which the readers ask what, when, where, why, what will happen, how, and who questions
7. *Summarization* in which the reader attempts to identify and write the main or most important ideas that integrate or unite the other ideas or meanings of the text into a coherent whole
8. *Multiple-strategy teaching* in which the reader uses several of the procedures in interaction with the teacher over the text

   Multiple-strategy teaching is effective when the procedures are used flexibly and appropriately by the reader or the teacher in naturalistic contexts (pp. 4-6).

While not all of these strategies are applicable to CTE, such as the story structure strategies about plot, many are applicable to learning from texts in CTE. Further, these strategies have been effective for improving student learning in other contexts.

Research has determined that reading strategy knowledge was the best predictor of reading achievement with fifteen 3rd- and 5th-grade students (Ramos, 1996), twenty-two 3rd-grade students and thirty-eight 6th-grade students (Lenhart, 1994), 86 middle and high school students (Yu, 1997), 379 junior high school students (Wolters, 1997), eighty-one 11th-grade social studies students (Ward-Washington, 2002), and with 106 college students (Hess, 1997). Studying the effectiveness of metacognitive strategy instruction with 152 White and Hispanic, lower middle class Arizona 6th-grade students using a nonequivalent pretest-posttest control group design, Tregaskes and Daines (1989) concluded that students taught with comprehension strategies increased their reading comprehension over the control group who received no instruction with strategies. Walkovic (2004) studied 8th-graders and found that student reported use of reading strategies accounted for 45% of the variance on the 8th-grade Pennsylvania System of School Assessment reading test. Therefore, reading strategy instruction appears to improve students' comprehension of texts.

Reading strategy instruction provides significant gains (Mothus, 2004; Simmonds, 1992), even for higher reading level students (Ferguson, 2001). Evaluating strategy intervention to increase ninety-eight 8th-grade students' comprehension, Mothus (2004) found that students participating in the intervention increased comprehension achievement scores more than one grade level, significantly more than the control group. Further, significant predictors of school failure included reading comprehension. Studying 24 New York State resource room teachers and their use of reading strategies, Simmonds (1992) determined that reading strategy instruction improved comprehension by nearly two standard deviations among 240 resource room students in grades one through nine. In determining the effect of metacognitive strategy instruction on twenty 6th-grade social studies students' content area reading comprehension, Ferguson (2001) found significant differences in the effectiveness of metacognitive strategy instruction on comprehension for high-level readers, as well as low- and average-level readers.

Investigating the effectiveness of teaching different strategies for identifying important concepts in content area reading through two different studies, Carriedo and Alonso-Tapia (1995) explored strategy use with thirty-one 11 and 12 year olds and one hundred-four 11 through 14 year olds. They concluded that the measures for which training was directed garnered significant improvement, including knowledge of the topic and main idea characteristics, graphical representation of relations among text ideas, knowledge of text structures, and summarizing, all strategies outlined by the NRP (2000). In the second study with 11 through 14 year olds under direct instruction, students perceived the main idea and topic of passages better than students without instruction. Additionally, students with direct instruction were more aware of cognitive processes, more able to represent text structure, and had

developed higher metacognitive knowledge than students without direct instruction in reading strategies.

Teachers' Use of Strategies

Career and technical education teachers focus on their content area as the primary priority. While this focus is justifiable, secondary priorities also exist. One of these secondary priorities may be to implement content area reading strategies when using texts as learning tools in order to facilitate students' learning from texts. Highly qualified CTE teachers would not allow students to use power tools or expensive computer technology without first learning the necessary instruction for safe and efficient operation. Similarly, scaffolding instruction to enable students to efficiently create meaning from texts is also vitally important for student learning from texts. In essence, by providing comprehension instruction that is deeply connected to content area learning, comprehension increases (Snow, 2002).

Yet, teachers are often reluctant to implement content area reading strategies in their content areas. Several reasons have been identified, including a lack of confidence in handling reading problems, the attitude that reading instruction infringes on content time, and the denial of the importance of reading for learning in the content area (Barry, 2002; Bean, 1997; Bintz, 1997; Durkin, 1978; Ivey, 2002; Moore et al., 1999; Snow, 2002; Stewart, 1990; Stewart & O'Brien, 1989). Among all content area teachers, agricultural science teachers have been demonstrated to hold problematic views of reading in the content area. O'Brien and Stewart (1990) found that 85% of preservice agricultural science teachers rejected content area reading. These teachers felt they reinforced content area reading and needed little instruction in strategies.

As a relatively small proportion of all teachers, CTE teachers in general, and agricultural science education teachers specifically, have not been studied to determine the factors that are associated with their attitudes toward reading and content area reading strategy instruction. What are the factors that are associated with agricultural science teachers' attitudes toward reading in agricultural science? Are gender, educational attainment, completion of a college reading course, and other factors associated with teachers' knowledge of content area reading strategies, frequency of content area reading strategy, and text use in their agricultural science courses?

Operational Description of Variables

Knowledge of content area reading strategies was assessed by participants' responses to how much knowledge they possessed about specific strategies in a list of 11 common strategies. Strategies consisted of collaborative strategic reading; Cornell notes; directed reading-thinking activities; graphic organizers; guided reading procedures; jig-sawing; Know-Want-Learned (K-W-L) charts; reciprocal

teaching; Socratic seminar; Survey, Question, Read, Recite, Review (SQ3R); and study guides.

Confidence in reading strategy use was assessed by the participants' responses to how much confidence they possessed with use of specific strategies in the same list of 11 common strategies. The strategies were the same as those identified for *knowledge of content area reading strategies*.

Frequency of strategy use was determined by participants' responses about how many times per week they used each of the individual strategies. Again, the strategies were the same as those identified for *knowledge of content area reading strategies*.

Personal attitude towards reading was defined as the respondent's general attitude towards reading. The researchers were attempting to ascertain the teacher's disposition towards reading as a tool for learning. Statements related to this construct included: *I enjoy reading*, *reading for pleasure is one of my hobbies*, *reading is almost always boring* (reverse coded), *reading has been useful for my personal development*, *a person learns very little from reading* (reverse coded), *books help us understand other people and ideas*, and *I make time for reading every day*.

Attitude towards reading in agricultural science was operationally defined as the teacher's predisposition towards using reading as a tool for learning in agricultural science courses. Statements related to this construct included (a) *reading is important in school-based agricultural education*; (b) *reading textbooks, magazines, and other publications is necessary for success in school-based agricultural education*; (c) *school-based agricultural education teachers are not responsible for developing students' reading skills* (reverse coded); (d) *good instruction in school-based agricultural education involves teaching reading strategies*; (e) *school-based agricultural education teachers are responsible for teaching reading skills*; (f) *reading is not important to success in school-based agricultural education*; and (g) *school-based agricultural education teachers should reinforce effective reading strategies*.

General approach to reading was operationally defined as the nonspecific instructional methodology with which a teacher engages students with texts. Items used to define this construct included the stem, "In my agricultural science courses, students are taught to…" with the endings of …*identify their purpose for reading*, …*preview texts before reading*, …*make predictions before reading*, …*think aloud while reading*, …*activate background knowledge for reading*, …*use text structure to build comprehension*, …*use more than one reading strategy*, …*determine important ideas in the reading*, …*generate questions about the text*, …*summarize what they read*, …*define unfamiliar words during reading*, …*monitor comprehension during reading*, and …*create visual representations to aid comprehension and recall*.

Purpose and Objectives

The purpose of the national survey of teachers who were members of the National Association of Agricultural Educators (NAAE) was to explore the relationships among practices and attitudes associated with reading in agricultural science. The objective of this study was to determine the characteristics of agricultural science teachers that best predicted the teacher's (a) attitudes toward reading in agricultural science, (b) general reading practices associated with reading in agricultural science, (c) knowledge of content area reading strategies, (d) frequency of content area reading strategy use in agricultural science, and (e) total text use in agricultural science.

Procedures

As part of a larger research endeavor, this study used a sample of the population of active and life members of the NAAE as listed in the 2003-04 database of membership provided by the NAAE (*N = 6,586*). From the accessible population, a random sample of 367 members was selected to estimate the distribution of characteristics within the population (Dillman, 2000). All members were listed in a Microsoft Excel database worksheet in alphabetical order by state affiliation. Using the random number generator, each individual was assigned a number. The database was then sorted by assigned random number and the 367 individuals with the highest random numbers were selected as the sample. The following calculation was performed to determine sample size:

$$Ns = \frac{(Np)\,(p)\,(1-p)}{[(Np-1)\,(B/C)^2 + (p)\,(1-p)]}$$

Where: Ns = completed sample size needed for the desired level of precision
Np = size of population
p = proportion of population expected to choose one of the two response categories
B = acceptable amount of sampling error; .03 = ±3% of the true population value
C = *Z*-statistic associated with confidence level; 1.96 corresponds to the 95% level

$$Ns = \frac{(6{,}586)\,(.50)\,(1-.50)}{[(6{,}586-1)\,(.05/1.96)^2 + (.50)\,(1-.50)]} = 363\ (\sim 367, \text{ from Dillman, 2000})$$

To develop the questionnaire, the researchers reviewed literature and other instruments of a similar nature, including those of Baldwin, Johnson, and Beer (1980) and Duke and Pearson (2002). Both of the instruments that were reviewed were problematic in their original forms. The Baldwin, Johnson, and Beer instrument was targeted at students and focused on reading for pleasure. Duke and Pearson provided an overview of general strategies (nonspecific to agricultural science

teachers) used by content area teachers. Thus, these instruments provided the basis for the instrument, as did the general literature review regarding teachers' use of content area reading strategies.

The questionnaire consisted of items related to the objectives of the study and was developed through numerous iterations as part of a survey methodology course project. The initial pool consisted of more than 150 items. Participants rated their knowledge and confidence in strategy use on a 6-point summated ratings scale, similar to a Likert-type scale, with "0" representing *none*, and "5" representing *expert* knowledge. Participants' responses were summated from the list of individual items representing each construct (see Table 1).

Face and content validity were assessed by a literacy professor at the University, a faculty member in education whose research focus is survey methodology, and two teacher educators in agricultural science education. To estimate validity and reliability, the survey instrument was administered to 14 agricultural science teachers. Reliability coefficients for the attitudinal and behavioral items ranged from .70 to .90 (see Table 1). Further, *post hoc* reliability analyses were conducted due to the insufficient number of participants in the pilot survey. Reliability did not vary to a large extent for any of the constructs; therefore, the researchers were reasonably assured of the instrument's reliability. Because items outside of these constructs involved those items for which respondents had "an accurate, ready-made answer" (Dillman, 2000, p. 37), they did not elicit demands for considerable time, thought, or variation, and, therefore, posed no considerable reliability risk.

Table 1
Reliability of individual questionnaire items

Variable	Number of items	Pilot α	Post hoc α
General approach to reading strategies	13	.90	.90
Confidence in use of reading strategy	11	.84	.84
Knowledge of reading strategies	11	.83	.83
Frequency of reading strategy use	11	.83	.83
Frequency of text use	17	.78	.78
Personal value of reading	9	.76	.76
Attitude towards reading in agriscience	7	.70	.71

The data were collected from February through May. The study was administered via the tailored survey design with a mailed questionnaire as outlined by Dillman (2000). A postcard was mailed to the participants alerting them about their selection for participation in the survey. Five days later, the initial questionnaires were mailed to the participants. Included in this mailing were a cover letter from the investigators, a letter from the National FFA Advisor, the

questionnaire, and a two-dollar incentive to enhance responses. Twelve days following the initial mailing, a reminder postcard was mailed to all participants who had not returned a questionnaire asking for their expedited responses. Ten days later, those participants who had not responded were mailed another questionnaire and asked to return it promptly. Again, six days after the questionnaire mailing, a reminder postcard was mailed to the participants. The participants were then contacted a final time in mid-April to remind them to return their questionnaires. The final questionnaires were returned in May prior to data analysis. This methodology resulted in a total of 216 returned usable questionnaires for a 58.9% response rate.

To control for nonresponse error, the researchers compared the early and late respondents (Ary, Jacobs, & Razavieh, 2002; Linder, Murphy, & Briers, 2001). Research has shown that late respondents are often similar to early respondents (Goldhor, 1974; Krushat & Molnar, 1993). Early respondents were those participants who returned their surveys prior to mailing the reminder postcard, while late respondents were those who responded after the second questionnaire was mailed. The respondents were compared based on gender, years of teaching experience, education level, college reading course completion, and the mean summated ratings of personal attitudes toward reading, attitudes toward reading in agricultural science, and general approach to reading. No significant differences existed between the early and late respondents.

The data were analyzed using the SPSS© for Windows™ statistical package, version 13.0 (2005). For each of the constructs, the total mean summated rating was calculated by summing the responses from each item in the construct and dividing that sum by the total number of items in the construct. Initially, descriptive statistical analyses, including means and standard deviations, were calculated to describe the sample. Within the major constructs, mean summated ratings were used to describe the variables. Thus, mean responses were calculated by summing the responses to individual items. Bivariate correlation analysis was performed on the major variables in the study. *T*-tests were conducted to compare the demographic variables of college reading course completion and gender with knowledge, confidence, and frequency of content area reading strategy use. It was determined *a priori* that statistical significance would be indicated for $\alpha \leq 0.05$. According to Agresti and Finlay (1997), stepwise regression is appropriate for exploratory research, or when attempting to "simply find a good set of predictors" (p. 522). Therefore, stepwise regression was used to select predictor variables from the larger pool of correlated variables (Licht, 2004).

Findings

The respondents represented 44 states and consisted of 84.7% males who held standard or permanent teaching licenses (96.6%). Years of teaching experience ranged from 1 to 39 years and averaged 17.3 years. High school teachers represented 80.1% of the sample. On average, teachers taught 6.03 agricultural science courses

and .25 non-agricultural science courses. Over one-third (36%, *n* = 75) of the sample held bachelor's degrees, 63% (*n* = 131) held master's degrees, and 1% (*n* = 2) held degrees above the master's level. A college content area reading course was completed by 39.2% of teachers.

Agricultural science teachers' mean knowledge of content area reading strategies and mean confidence in content area reading strategy use were 1.76 (*SD* = .62) and 1.71 (*SD* = .64), respectively (see Table 2). The mean frequency of use of individual content area reading strategies ranged from 0 to 3.55 with an overall mean of .62 (*SD* = .62). Teachers valued reading from a personal standpoint (*M* = 3.98, *SD* = .58), but placed higher value on the importance of reading in agricultural science (*M* = 4.10, *SD* = .53). *General approach to reading in agriscience* was defined as how teachers approach text from a learning standpoint. Items comprising this construct included the stem, "In my agricultural science courses, students are taught to...," followed with "…identify their purpose for reading, …preview texts before reading, …make predictions before reading, …activate background knowledge for reading, …determine important ideas in the reading, and …monitor comprehension during reading," among others. Teachers used general approaches to reading with more frequency (*M* = 3.13, *SD* = .74). On average, teachers used text in 53% of their classes (*SD* = .22). Teachers used text for a mean of 17.64 minutes per use (*SD* = 4.49). Cumulatively, teachers used text for 290.3 minutes per week (*SD* = 162.7)

Table 2
Summary of Variables Related to Agricultural Science Teachers' Use of Content Area Reading Strategies and Text

	n	Range	*M*	*SD*
Knowledge of reading strategies[a]	210	.82 – 3.55	1.76	.62
Confidence in reading strategy use[b]	210	.00 – 3.55	1.71	.64
Frequency of reading strategy use[c]	210	.00 – 2.64	.62	.62
Personal value of reading[d]	210	2.00 – 5.00	3.98	.58
Attitude towards reading in agriscience[e]	210	2.43 – 5.00	4.10	.53
General approach to reading in agriscience[f]	210	.00 – 5.00	3.13	.74
Frequency of text use[g]	202	.10 – 1.00	.53	.22
Intensity of text use[h]	199	5.00 – 25.00	17.64	4.49
Cumulative use of text in agriscience[i]	198	28.10 – 721.90	290.30	162.70

[a] Mean summated rating, 0 = none, 5 = expert. [b] Mean summated rating, 0 = none, 5 = expert. [c] Number of times per week per class. [d] Mean summated rating for 9 items. [e] Mean summated rating for 7 items. [f] Mean summated rating for 13 items. [g] Percent of classes. [h] Minutes per use. [i] Minutes per week

Using the mean frequency and intensity of textbook use, the total amount and percent of class time per week spent using texts based on 1,500 minutes of

instruction per week were computed. The researchers arrived at 1,500 minutes of instruction by calculating the following formula:

50 minutes/traditional period * 6 periods / day * 5 days / week = 1,500.

While instructional time may vary depending upon the class schedule, instructional time for each teacher on a weekly basis should be approximately the same. On average, agricultural science teachers used texts as learning tools in 52.6% of class periods per week, or 15.78 periods, and 17.64 minutes per use. Within 30 periods of instruction per week, teachers have the opportunity to teach for 1,500 minutes per week. Based on these figures, teachers use text for 290.3 minutes per week (19.35% of instructional time).

Correlation analyses were conducted comparing demographic variables to constructs of interest related to teachers' attitudes toward reading (see Tables 3 and 4) and used the conventions provided by Davis (1971). Davis described *negligible* relationships as those with a correlation of .01 to .09, *low* relationships as those with a correlation of .10 to .29, *moderate* relationships as those with a correlation of .30 to .49, *substantial* relationships as those with a correlation of .50 to .69, and *very high* relationships as those with a correlation of .70 to .99. For the purposes of correlation analysis, males, standard/permanent licensure, and completion of a college reading course were coded with a "1" and responses that were female, held a temporary licensure, and lacked a college reading course were coded with a "0". A *very high* positive correlation (i.e., r = .84 and r = .77) was discovered between knowledge of content area reading strategies and both confidence in and frequency of using content area reading strategies, as well as between confidence in and frequency of use of content area reading strategies. *Moderate* positive correlations (i.e., r = .43) were discovered between frequency and intensity of text use, gender and years teaching experience; and general approach to reading and frequency of, knowledge of, and confidence in content area reading strategy use. Further, a *moderate* positive correlation (i.e., r = .32) was discovered between personal value of reading and attitudes toward reading in agricultural science.

A teacher's general approach to reading in agricultural science showed a *low* positive correlation between both attitude towards reading in agricultural science (i.e., r = .26), frequency of text use (i.e., r = .23), and the teacher's personal value of reading (i.e., r = .14). Knowledge of content area reading strategies had a *low* positive correlation between completion of a college reading course (i.e., r = .23), the teacher's attitude towards reading in agricultural science (i.e., r = -.02), and intensity of text use (i.e., r = .10). Frequency of content area reading strategy use had a *low* positive correlation between frequency of text use (i.e., r = .25), completion of a college reading course (i.e., r = .21), the teacher's attitude towards reading in agriscience (i.e., r = .20), and intensity of text use (i.e., r = .16). Completion of a college reading course had a *low* positive correlation (i.e., r = .16) with confidence in use of content area reading strategies. Confidence in content area reading strategy use had a *low* positive correlation with the teacher's attitude towards reading in agricultural science (i.e., r = .15) and frequency of text use (i.e., r = .14). Years of

teaching exhibited a *low* positive correlation with education (i.e., r = .21), licensure (i.e., r = .21), and teacher's attitude towards reading in agriscience (i.e., r = .15). Frequency of text use was also positively correlated with both intensity of text use (i.e., r = .43) and personal value of reading (i.e., r = .15).

Table 3
Correlations between Demographic Variables and Reading Criteria

		1	2	3	4	5	6	7	8	9	10
1.	Years teaching experience	---	-.17*	-.18*	.01	.06	.15*	.00	.00	.07	.03
2.	Knowledge of reading strategies		---	.84*	.77*	.12	.19*	.35*	.13	.15*	.14
3.	Confidence in use of reading strategies			---	.70*	.11	.15*	.32*	.14*	.14	.14*
4.	Frequency of use of reading strategies				---	.09	.20*	.38*	.25*	.16*	.25*
5.	Personal value of reading					---	.32*	.14*	.15*	.03	.12
6.	Attitude towards reading in agriscience						---	.26*	.09	.07	.12
7.	General approach to reading							---	.23*	.21*	.26*
8.	Frequency of text use								---	.43*	.91*
9.	Intensity of text use									---	.72*
10.	Total text use (time)										---

* $p \leq .05$.

Low negative correlations were discovered between licensure and knowledge (i.e., r = -.20), confidence (i.e., r = -.22), and frequency of content area reading strategy use (i.e., r = -.23). Gender exhibited a *low* negative correlation with knowledge (i.e., r = -.21) and confidence in content area reading strategies (i.e., r =

-.17). Years teaching experience had a *low* negative correlation with knowledge (i.e., r = -.17) and confidence in content area reading strategies (i.e., r = -.18).

Table 4
Point-Biserial Correlations Between Categorical and Continuous Variables

	Gender	Education	College reading course	License
Gender	---	-.03	-.04	.07
Education[a]		---	-.07	.08
College reading course			---	-.07
License				---
Years teaching experience	.40*	.21*	-.13	.21*
Knowledge of reading strategies	-.21*	.05	.23*	-.20*
Confidence in reading strategy use	-.17*	.06	.16*	-.22*
Frequency in use of reading strategies	.03	.01	.21*	-.23*
Personal value of reading	-.09	.12	.01	.12
Attitude towards reading in agriscience	.01	.06	-.02	.02
General approach to reading	.03	.13	.13	-.05
Frequency of text use in agriscience	.02	-.05	.08	-.12
Intensity of text use in agriscience	-.05	-.04	.10	-.05
Total text use (time)	-.01	-.06	.06	-.14

[a]Bachelor's degree = 1, master's degree = 2, doctoral degree = 3.
*$p \leq .05$.

Based upon the findings from the correlation analyses, *t*-tests were conducted to determine differences between completion of a college reading course and gender with knowledge, confidence, and frequency of content area reading strategy use. Teachers completing a college reading course as part of their teacher preparation programs responded with higher confidence, frequency, and knowledge of content area reading strategies (see Table 5). The effect size for completion of a college reading course on knowledge of content area reading strategies was d = .47 (Gall, Gall, & Borg, 2003). Additionally, the effect size for completion of a college reading course on confidence in use of content area reading strategies was d = .32. Further, the effect size for completion of a college reading course on frequency of use of content area reading strategies was d = .43.

Female teachers demonstrated higher confidence in content area reading strategies than did males (see Table 6). Females' mean confidence in content area reading strategies was 1.97 (SD = .72) compared to males with 1.66 (SD = .62).

Females also demonstrated greater knowledge of content area reading strategies than did their male counterparts. Females rated their knowledge of content area reading strategies with a mean of 2.06 (*SD* = .69), while males rated their knowledge with a mean of 1.76 (*SD* = .62). The effect size for gender on knowledge of content area reading strategies was *d* = .55 (Gall et al., 2003). The effect size for gender on confidence in use of content area reading strategies was *d* = .46. As there was no significant difference between males and females related to frequency of strategy use, there was no significant effect size.

Table 5
Significant Differences in Enrollment of College Reading Courses and Confidence, Frequency, and Knowledge of Content Area Reading Strategy Use

	College Reading Course							95% CI of mean difference
	Yes		No					
	Mean	*SD*	*Mean*	*SD*	*df*	*t*	*p*	
Knowledge	1.94	.71	1.65	.53	207	2.32	.02	.12-.46
Confidence	1.84	.70	1.63	.59	207	3.11	.00	.03-.39
Frequency	.79	.72	.52	.53	207	3.41	.00	.10-.44

Table 6
Significant Differences Between Gender and Confidence, Frequency, and Knowledge of Content Area Reading Strategy Use

	Gender							95% CI of mean difference
	Female		Male					
	Mean	*SD*	*Mean*	*SD*	*df*	*t*	*p*	
Knowledge	2.06	.69	1.71	.59	207	3.02	.00	.12-.58
Confidence	1.97	.72	1.66	.62	207	2.49	.01	.06-.54
Frequency	.58	.50	.63	.64	207	-.43	.67	-.29-.18

Objectives

In the first objective, the researchers sought to determine the characteristics of agricultural science teachers that best predicted their attitudes toward reading in agricultural science. Years of teaching experience, knowledge of content area reading strategies, confidence in content area reading strategy use, frequency of content area reading strategy use, personal value of reading, and general approach to using reading were entered into a backward stepwise regression equation to determine which variables best predicted teachers' attitudes. The resulting equation, consisting of the teacher's personal value of reading, general approach to using reading, years of teaching experience, and knowledge of content area reading strategies, explained

17% of the variance in attitude towards reading in agricultural science (see Table 7). Personal value of reading explained the largest amount of variance (R^2 change = .10).

Table 7
Attitudes Toward Reading in Agricultural Science

	B	*SE*	β	*t*	R^2 change
(Constant)	2.34	.27	---	8.71	---
Personal value of reading	.24*	.06	.27	4.15	.10
General approach to reading	.14*	.05	.19	2.81	.05
Years teaching	.01*	.00	.16	2.41	.02
Knowledge of reading strategies	.11*	.06	.13	1.91	.00

Note. Adjusted R^2 = .17, $p \leq .05$.
*$p \leq .05$.

With Objective 2, the researchers sought to determine the characteristics of agricultural science teachers that best predicted their general approach to reading in agricultural science. Knowledge of content area reading strategies, confidence in content area reading strategies, frequency of content area reading strategy use, personal value of reading, attitude towards reading in agriscience, frequency of text use, intensity of text use, and total text use were initially used in the model. Using backward stepwise regression, the resulting model explained 20% of the variance (see Table 8), and consisted of frequency of content area reading strategy use, attitude towards reading in agriscience, and intensity of text use. Frequency explained the most variance (R^2 change = .15).

Table 8
General Approach to Using Reading Strategies in Agricultural Science

	B	*SE*	β	*t*	R^2 change
(Constant)	1.43	.39	---	3.68	---
Frequency of reading strategy use	.38*	.08	.32	4.90	.15
Attitude towards reading in agricultural science	.26*	.09	.20	3.01	.04
Intensity of text use	.02*	.01	.15	2.29	.02

Note. Adjusted R^2 = .20, $p \leq .05$.
*$p \leq .05$.

In Objective 3, the researchers sought to predict teachers' knowledge of content area reading strategies (see Table 9). The regression equation explained 22% of the variance. Originally, gender, years of teaching experience, completion of a college reading course, licensure, attitude towards reading in agricultural science,

and general approach to using reading were included in the model. Although they were significantly correlated, confidence and frequency of content area reading strategy use were not included in the model, because they were determined to be products of knowledge. Five variables explained 24% of the variance in knowledge of content area reading strategies: general approach to using reading, gender, licensure, completing a college reading course, and attitude towards reading in agricultural science.

Table 9
Knowledge of Content Area Reading Strategies

	B	*SE*	β	*t*	R^2 change
(Constant)	1.08	.38	---	2.83	---
General approach to reading	.22*	.06	.25	3.79	.12
Gender	-.33*	.11	-.20	-3.10	.05
License	-.59*	.21	-.18	-2.80	.03
College reading course	.21*	.08	.17	2.61	.03
Attitude towards reading in agricultural science	.19*	.08	.16	2.46	.02

Note. Adjusted $R^2 = 0.24$, $p \leq .05$.
*$p \leq .05$.

In Objective 4, the researchers sought to determine the characteristics of agricultural science teachers that best predicted their frequency of content area reading strategy use. Completion of a college reading course, licensure, knowledge of content area reading strategies, confidence in content area reading strategy use, attitude towards reading in agricultural science, general approach to reading, and frequency, intensity, and cumulative text use were originally included in the model. The regression equation predicted 67% of the variance using five variables: (a) knowledge of content area reading strategies, (b) total time of text use, (c) general approach to using reading in agricultural science, (d) confidence in content area reading strategy use, and (e) the intensity of text use (see Table 10).

Through the final objective, the researchers sought to determine the characteristics of agricultural science teachers that best predicted their cumulative use of text in agricultural science courses. The regression model initially included licensure, confidence in content area reading strategy use, frequency of content area reading strategy use, general approach to reading, frequency of text use, and intensity of text use. Confidence in content area reading strategy use, frequency of reading strategy use, and general approach to reading were removed from the final equation because they lacked statistical significance in predicting variance. A regression equation consisting of frequency of text use, intensity of text use, and licensure predicted 96% of the variance in cumulative text use (see Table 11).

Table 10
Frequency of Specific Content Area Reading Strategy Use

	B	*SE*	β	*t*	R^2 change
(Constant)	-.96	.15	---	-6.54	---
Knowledge of reading strategies	.63*	.08	.63	8.32	.64
Total time of text use	.00*	.00	.19	3.25	.02
General approach to reading	.10*	.04	.11	2.54	.01
Confidence in reading strategy use	.14*	.07	.14	1.84	.00
Intensity of text use	-.02*	.01	-.11	-1.90	.00

Note. Adjusted $R^2 = 0.67$, $p \leq .05$.
*$p \leq .05$.

Table 11
Total Text Use (Time)

	B	*SE*	β	*t*	R^2 change
(Constant)	-218.87*	16.74	---	-13.08	---
Frequency of text use	534.00*	12.15	.73	43.97	.82
Intensity of text use	14.52*	.60	.40	24.27	.13
License	-27.92*	13.24	-.03	-2.11	.00

Note. Adjusted $R^2 = .96$, $p \leq .05$.
*$p \leq .05$.

Conclusions, Discussion, and Implications

When reflecting on the findings of this research, the teacher's place within the sociocultural context of the classroom and his or her influence upon students are the main foci. Thus, when viewed from this perspective, the findings indicated something about how agricultural science teachers not only value reading and text as learning tools, but also how those values manifested themselves through the teacher's classroom instruction.

In this national survey, the data suggested that agricultural science teachers do value reading from a personal standpoint and as a learning tool in their agricultural science courses. This contradicts previous findings about agricultural science teachers' perceptions toward reading and literacy suggesting that content area teachers tend to devalue learning from text (D'Arcangelo, 2002; Forget & Bottoms, 2000; Moore et al., 1999; Snow, 2002), especially those in agricultural science (O'Brien & Stewart, 1990). Perhaps today's teachers who have completed college reading courses are using newer editions of text that are more reader-friendly, and/or these teachers have adopted the stance that *reading is fundamental*. Regardless, the

positive approach to reading and enhancing reading instruction should aid all students in improving their reading comprehension and literacy (Forget & Bottoms, 2000; Ivey, 2002; NRP, 2000; Rhoder, 2002). As a powerful force within the sociocultural context of the classroom (Snow, 2002), teachers who value reading should demonstrate it to students through their instructional practices.

Although teachers valued reading, their overall knowledge and confidence in content area reading strategies were low. However, these variables were *very highly* correlated, therefore, a low value in one area could indicate low values in other areas. Further, the frequency of content area reading strategy use appeared low among these teachers. On average, agricultural science teachers used content area reading strategies less than two times per class for every three weeks of instruction. While the frequency of use of strategies seemed low, it may be appropriate given the kinds of learning that occur within a CTE classroom. Perhaps teachers use strategies in an acceptable proportion with their other instructional practices. Observations of classroom practices with special focus on literacy instruction could shed light on this issue. The important consideration is that while teachers generally valued reading, especially in the CTE area, they lacked the knowledge and confidence to use content area reading strategies with high frequency.

Frequency of text use was *moderately* correlated with intensity of text use and *very highly* correlated with total text use. Additionally, intensity of text use was *very highly* correlated with total text use. These findings were supported in other research where engagement in reading episodes was positively associated with student gains in comprehension and reading ability (Snow, 2002). Within the activity of reading (Snow, 2002), one hopes that CTE teachers would assist their students in learning from text and, thereby, implement content area reading strategies alongside of text use.

When considering the gender of teachers, females demonstrated a *low* positive correlation with knowledge of content area reading strategies and confidence in content area reading strategy use. Female teachers appeared to be more knowledgeable and confident in reinforcing and teaching with text and content area reading strategies. While the literacy prowess of female agricultural science teachers should be celebrated, the comparable shortfall of reading knowledge and confidence among male teachers is cause for alarm. As agricultural science education remains a male-dominated discipline, many students may not be experiencing an agricultural science teacher who is knowledgeable and confident when using text as a learning tool.

Completion of a college reading course also demonstrated *low* positive correlations with knowledge of, confidence in, and frequency of content area reading strategy use, and yielded effect sizes of .47, .32, and .43 for knowledge, confidence, and frequency of strategy use, respectively. Many teacher preparation institutions require completion of a college reading course for teacher certification. Oftentimes, this course has been separate from other teaching methods courses; therefore, some students may not have seen the connection between use of literacy strategies and

planning for instruction. However, the findings in this study indicated that the reading course did have an impact on the use of content area reading strategies in CTE courses. The data reinforced the value of requiring completion of content area reading courses for teacher certification. Those teachers completing college reading courses demonstrated higher levels of knowledge, confidence, and frequency of text use in their agricultural science courses. While the college reading course difference was *statistically* significant for completers versus noncompleters, did it have *practical* significance, especially concerning the frequency of content area reading strategy use?

The difference in frequency of content area reading strategy use between college reading course completers and noncompleters was .27 times per course per week. This did not seem to have practical significance until that difference was multiplied by the number of weeks in the school year, 36, which resulted in a year long difference in the number of content area reading strategies of 9.72. Teachers who completed a college reading course used nearly 10 more content area reading strategies per course per year than their counterparts who did not complete a college reading course. That was nearly 10 more episodes of active engagement with text per course. Is this practically significant? Yes, it appears to be. Therefore, this may be evidence supporting that a teacher's preparation with reading strategies influences the activity of reading and learning from text for students enrolled in CTE courses (Snow, 2002).

Objective 1 sought to determine the significant factors associated with teachers' attitudes toward reading in agricultural science. While the entire model consisting of three variables explained 15% of the variance, the major contributor to this portion of explained variance was the teachers' personal value of reading. When teachers personally value reading and are themselves readers, they translate these factors into classroom practice (Dillon, 2003; Yore, 1991). Therefore, improving the culture of reading in career and technical classes may be dependent on the teacher's personal attitude towards reading, especially as a learning tool.

Objective 2 sought to determine the significant factors associated with agricultural science teachers' general approach to using reading strategies. Again, despite the small explained variance (17%), the model was comprised of two factors: frequency of content area reading strategy use and attitude towards reading in agricultural science. Therefore, if teachers were using content area reading strategies, then they were generally approaching text as a learning tool. Again, this reinforces the idea that the teacher contributes to the sociocultural environment of the classroom, which in turn impacts how students engage in the activity of reading (Snow, 2002).

Objective 3 sought to explain the variables associated with knowledge of content area reading strategies. Five variables, including general approach to reading in agriscience, gender, completion of a college reading course, licensure, and attitude towards reading in agricultural science explained 22% of the variance. Female teachers who held professional licenses, completed a college reading course, used

effective general approaches to reading, and were positively predisposed to using reading as a learning tool were likely to be more knowledgeable about content area reading strategies. Again, the completion of a college reading course influences the teacher's knowledge of reading strategies.

Perhaps the most interesting conclusion emerged from objective 4. A model consisting of knowledge of content area reading strategies, frequency of text use, confidence in content area reading strategies, and general approach to reading explained 67% of the variance in frequency of content area reading strategy use. Of those variables, knowledge of content area reading strategies explained nearly 64% of the variance by itself. Knowledge of reading strategies influences the teacher's use of strategies in the classroom context, which impacts a student's use of reading strategies, or the activities associated with reading (Snow, 2002). Therefore, it could be concluded that increased teachers' knowledge of content area reading strategies increased the frequency with which they taught students to use content area reading strategies as learning tools. This is clearly within the realm of CTE teacher education programs. If CTE teacher education programs added parameters to check preservice teachers' knowledge of content area reading strategies, then they may be able to influence positively content area reading strategy use in high school CTE classrooms. When teachers know how to use content area reading strategies, they use them. In contrast, lacking knowledge of content area reading strategies, teachers will not use them effectively.

The final objective sought to determine the variables associated with cumulative use of text in agricultural science courses. In agricultural science education, total time of text use was primarily a function of frequency of text use (R^2 *change* = 0.824). This seems to be a logical conclusion. Further, as teachers use text more frequently, texts are more often used as learning tools. Therefore, if teachers want to demonstrate the value of text by implementing additional text opportunities, then they may not necessarily spend a lot of time per instance in text use, but use texts frequently in their CTE courses. This would increase the time engaged in the activity of reading (Snow, 2002).

Limitations of the Study

This study had two major limitations. First, the membership of NAAE may not have been representative of the nearly 10,000 agricultural science teachers across the nation. However, the sampling frame of more than 6,500 NAAE members represented the most available and an efficient frame for a national survey of agricultural science teachers. The cooperation and assistance demonstrated by the NAAE and its membership was appreciated. Secondly, this survey garnered a response rate (58.9%) that was less than desirable. Therefore, although early and late respondents revealed no significant differences in their responses to individual items on the questionnaire, the possibility still exists that respondents could have responded somewhat differently than nonrespondents. These practical limitations, however, do

not necessarily limit the appropriateness of the methods used in and results of the study.

Recommendations

Several recommendations are offered based upon the results of the national survey of agricultural science teachers. First, career and technical education teacher education institutions, especially those preparing the nation's agricultural science teachers, should continue to require college reading courses as part of teacher certification. Further, because knowledge and confidence of content area reading strategies appear to enhance the frequency of content area reading strategy use, then teacher educators should model appropriate reading strategies in teaching methods courses and other courses when reading is used as a learning tool.

Because personal value and attitude toward reading in agricultural science were significant variables in many of the regression models in this study, these attitudinal factors should be considered during teacher preparation. Preservice teachers should examine their own attitudes regarding reading, both from a personal and an instructional standpoint. In fact, several studies have suggested that the teacher is a significant factor in students' reading culture (Bintz, 1997; Guthrie, Schafer, Wang, & Afflerbach, 1995; Moje, 1996; NRP, 2000; Sanchez, 2003; Snow, 2002).

This study stimulates questions for further research. For example, do agricultural science teachers compare with other CTE teachers in their attitudes toward reading, preparation for instruction with reading, and knowledge, confidence, and frequency of text use? Additionally, why do teachers seem to value reading and literacy, yet fail to implement reading and use of reading strategies with great frequency in their CTE courses? Further, is the frequency with which teachers use content area reading strategies appropriate for the context and learning that occur in CTE courses? Also, if confidence and knowledge are limiting factors, what models of professional development would prepare teachers with improved knowledge and confidence in the use of content area reading strategies? Finally, for the teachers who are currently using reading strategies in their instruction, how effectively is the use of content area reading strategies for improving student achievement in reading and learning in CTE? These and other questions are important to answer in the CTE research community. Future investigations will likely lead to expanded theory and improved practice in the CTE field.

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