Journal of Applied Communications

Volume 89 | Issue 1 Article 2

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Recommended Citation

Bisdorf-Rhoades, Emily; Ricketts, John; Irani, Tracy; Lundy, Lisa; and Telg, Ricky (2005) "Critical Thinking Dispositions of Agricultural Communications Students," *Journal of Applied Communications*: Vol. 89: Iss. 1. https://doi.org/10.4148/1051-0834.1300

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Critical thinking, a reasoned, purposive, and introspective approach to solving problems, has received increased attention from agricultural educators. This study of agricultural communications students utilized a directly administered survey to investigate critical thinking dispositions of agricultural communications students at 12 universities. Results indicated that agricultural communications student respondents tend to be highly innovative in their thinking, an important trait in the field of communications. Results also indicated that few agricultural communication students would be classified as having a strong disposition toward critical thinking, while a larger number would be classified as weak in critical thinking dispositions.

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Critical thinking, a reasoned, purposive, and introspective approach to solving problems, has received increased attention from agricultural educators. This study of agricultural communications students utilized a directly administered survey to investigate critical thinking dispositions of agricultural communications students at 12 universities. Results indicated that agricultural communications student respondents tend to be highly innovative in their thinking, an important trait in the field of communications. Results also indicated that few agricultural communication students would be classified as having a strong disposition toward critical thinking, while a larger number would be classified as weak in critical thinking dispositions.

Introduction

Teaching critical thinking has received increased attention from agricultural educators in recent years. Critical thinking typically involves the individual's ability to do some or all of the following: "identify central issues and assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority" (Pascarella & Terenzini, 1991, p. 118). Halpern (1989) described critical thinking as "thinking that is purposeful, reasoned and goal directed" (p. 5). Paul and Scriven (2003) described critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication as a guide to belief and action" (p. 1).

Agricultural educators have studied critical thinking as it relates to dispositions, learning styles (Torres & Cano, 1995), pre-service teacher preparation, and cognition at secondary and post-secondary levels (Newcomb &

Trefz, 1987; Rollins, 1990; Rudd, Baker, & Hoover, 2000; Torres & Cano, 1995). Rudd et al. (2000) argued for greater study of critical thinking by agricultural educators and researchers, citing lower than expected scores for disposition to think critically among agricultural students. The authors stressed the role critical thinking plays in making connections between areas of inquiry or drawing of inferences that can be utilized by faculty members in college classrooms (Rudd et al., 2000).

Cano and Martinez (1991), who defined critical thinking as "a set of thinking skills needed to answer a particular question" (p. 24), found a linear relationship between critical thinking and grade level of Ohio agricultural education students, as measured by the Developing Cognitive Abilities Test (DCAT). Torres and Cano (1995), in a study of agricultural students from Ohio State University, found that students scored the lowest on the critical thinking portion of the DCAT and that there was no significant difference between males and females in critical thinking scores. Torres and Cano (1995) reported that pre-service teachers are more likely to emphasize basic and application thinking skills and abilities than skills and abilities requiring critical thinking. Rollins (1990) examined the critical thinking of high school agriculture students in Iowa and found that seniors were better critical thinkers than sophomores.

Whittington (1995, 2000), in a study of 28 faculty at the University of Idaho found that faculty members wanted to teach at all levels of cognition but actually taught at low levels of thinking–98% of the time. The faculty members aspired to teach at levels higher than where they were assessed and had favorable attitudes toward teaching at higher levels of cognition. Whittington found that faculty who had experienced more educational activities held more favorable attitudes towards teaching at higher cognitive levels. Whittington (1997) had also found that the instructor was the factor having the greatest effect on thinking opportunities.

One academic area in which it is important to make connections and draw inferences is agricultural communications, where students must learn to be inquisitive in writing and reporting and persuasive, logical, and open-minded in putting together compelling arguments. Professional communicators need logic and reasoning skills to effectively communicate topics, such as agriculture, which can sometimes be misunderstood or controversial, to audiences. In turn, communicators also must be able to understand the audiences they are reporting to and the influence of the potential biases that the audience, and they themselves, might possess (Paul & Scriven, 2003).

Purpose and Objectives

The purpose of this study was to assess critical thinking dispositions of agricultural communications students. The specific objectives of this study were to describe agricultural communications students in terms of their critical thinking dispositions and to determine the influence of demographics on agricultural communications students' critical thinking dispositions. Critical thinking dispositions, as defined for this study, are a set of intellectual virtues or habits of mind which constitute the overall disposition to think in a critical manner (Facione, Facione, & Giancarlo, 1996).

Methods and Procedures

The population for the study were students in all active undergraduate agricultural communications programs, defined as those programs with an agricultural communications major, at least two course offerings in the major, and an active Agricultural Communicators of Tomorrow (ACT) chapter. To conduct the study, faculty advisors from the 20 agricultural communications programs that fit these criteria were contacted by e-mail cover letter and asked if they would be willing to participate. Twelve faculty advisors agreed to participate and were subsequently mailed copies of the survey instrument. Faculty advisors were given instructions to distribute the survey to a sample of students taking agricultural communications classes. An e-mail was sent to each participating faculty several weeks later as a second reminder (Dillman, 1999). There were 319 responses from a sampling frame of 570 possible participants, for a response rate of 55.96%. To control for non-response error, early and later respondents were compared. No significant differences were observed.

The University of Florida–Engagement, Maturity, and Innovativeness (UF-EMI) assessment was the survey instrument used to measure agricultural communications students' critical thinking disposition. The instrument is a 33-item, five-point Likert-type scale, with a demographics portion at the conclusion of the assessment. The UF-EMI used Facione's (1990) original Delphi study, from which Facione developed the California Critical Thinking Disposition Inventory (CCTDI). The CCTDI consists of the following sub-constructs: truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity (Facione, Facione, & Giancarlo, 2001).

Because of validity and other concerns expressed by researchers about the CCTDI (Bondy, Koenigseder, Ishee, & Williams, 2001; Walsh & Hardy, 1997), the UF-EMI was developed as a more domain-specific measure of critical thinking dispositions (Ricketts & Rudd, 2005). The UF-EMI focuses on

three subscales or constructs: innovativeness, cognitive maturity, and engagement. The UF-EMI is shorter than the CCTDI (Ricketts, & Rudd, 2005). A description of the EMI subscales follows:

- The engagement disposition measures people's predisposition to looking for opportunities to use reasoning, anticipating situations that require reasoning, and confidence in reasoning ability.
- The cognitive maturity disposition measures predisposition to being aware of the complexity of problems, being open to other points of view, and being aware of their own and others biases and predispositions.
- The innovativeness disposition measures predisposition to be intellectually curious and desire to know the truth.

Researchers in this study conducted post hoc reliability testing of the UF-EMI. The innovativeness construct was reported to have a standardized Cronbach's alpha of 0.76; the engagement construct was reported as having a standardized Cronbach's alpha of 0.85; and the cognitive maturity construct had a Cronbach's alpha of 0.59. The low reliability of the maturity construct led the researchers to investigate instrument validity through conducting a factor analysis. The communalities for the maturity items were lower than the desired level.

Means and standard deviations were calculated for the descriptive portion of the study. Independent samples t-tests and analysis of variance procedures were used to determine the association between the critical thinking disposition and selected agricultural communication student demographics.

Findings

A total of 319 students participated in the study. This included agricultural communications majors (227) and non-majors taking an agricultural communications class (66). Of the 319, there were 26 graduate students and 293 undergraduate students. For the purposes of this study, only responses from those students indicating that they were undergraduates majoring in agricultural communications were analyzed. The resulting respondent pool included 59 (26.0%) males and 168 (74.0%) females. More than two thirds (68.3%) of the students' grade point average was in the 3.0 to 3.9 range, on a 4.0 scale.

The mean total score of the UF-EMI was calculated as 113.58. Scores ranged from a low of 72.86 to a high score of 141.89. (See Table 1.) The UF-EMI utilizes the CCTDI cutoff points developed by Facione and colleagues (1996, p.13) to determine a strong, medium, and weak disposition to critical thinking. A reported score of 136.95 or higher on the UF-EMI is considered a

strong disposition while a 135.30 to a 110.55 score is moderate, and a score of 108.90 or less constitutes a weak disposition to critical thinking.

When broken down by specific dispositions, innovativeness was the highest-rated, with scores ranging from 25.0 to the highest possible score of 55. Engagement scores were the second-highest disposition toward critical thinking, with scores ranging from 22.31 to 50. Cognitive maturity was the lowest-rated disposition, with scores ranging from 15.56 to 41.11.

Table 1. *UF-EMI: Critical thinking disposition scores.*

	n	Minimum	Maximum	*M*	*SD*
Innovativeness	227	25.00	55.00	44.22	4.74
Engagement	227	22.31	50.00	40.04	4.49
Cognitive Maturity	227	15.56	41.11	29.32	4.33
Total CT Disposition	**227**	**72.86**	**141.89**	**113.58**	**9.68**

Males scored an average of 114.63, while females scored an average of 113.20 on the total critical thinking disposition, t (227) = .257, p >0.05. There was also no statistical or practical difference between males and females for any of the constructs: innovativeness, engagement, or cognitive maturity. (See Table 2.)

Table 2. *Differences in male and female critical thinking dispositions.*

Disposition	Gender	*n*	*M*	*SD*	*t*
Innovativeness	Male	59	44.05	5.14	-.319
	Female	168	44.28	4.60	
Engagement	Male	59	40.77	4.96	1.458
	Female	168	39.78	4.30	
Cognitive Maturity	Male	59	29.81	3.69	1.014
	Female	168	29.15	4.53	
Total CT Disposition	Male	59	114.63	10.18	.973
	Female	168	113.20	9.5	

Finally, level of education was not associated with critical thinking disposition, t (227) = .416, p> 0.05. As shown in Table 3, first-year students showed no statistical difference from seniors on innovativeness, engagement, and cognitive maturity. Seniors scored a total critical thinking disposition of 115.06 while first-year students scored 111.85.

Table 3. *Differences in critical thinking dispositions by level of education.*

Disposition	Education Level	*n*	*M*	*SD*	*F*
Innovativeness	Freshman	30	43.52	3.54	.95
	Sophomore	51	44.98	4.78	
	Junior	79	43.70	4.78	
	Senior	123	44.51	4.98	
Engagement	Freshman	30	39.36	3.21	1.75
	Sophomore	51	40.03	4.43	
	Junior	79	39.28	4.46	
	Senior	123	40.82	4.82	
Cognitive Maturity	Freshman	30	28.97	4.08	.78
	Sophomore	51	29.63	4.99	
	Junior	79	28.73	4.99	
	Senior	123	29.72	4.35	
Total CT Disposition	Freshman	30	111.85	8.25	2.00
	Sophomore	51	114.65	9.37	
	Junior	79	111.70	8.60	
	Senior	123	115.06	10.69	

Discussion/Conclusions

This study attempted to identify and describe critical thinking dispositional tendencies of agricultural communications students. Findings in this study indicated that future agricultural communicators' critical thinking dispositions' strength ranged greatly, from scores of 72.86 to 141.89. The innovativeness construct had the highest mean, while the overall critical thinking disposition mean score was 113.58. No statistical differences were found between male and female respondents for any of the constructs. This finding differs from both Walsh and Hardy (1997), who found gender to be predictive of variance in critical thinking disposition, and Rudd, Baker, and Hoover (2000), who found significant gender differences, with females scoring higher in critical thinking disposition than males. It may be that in a female-dominant field, such as agricultural communications, gender difference may not be as significant, or that agricultural communications attracts male and female students with similar critical thinking dispositional characteristics. Further research is needed in this area.

Regarding level of education, while the overall mean critical thinking score was higher for seniors (115.06) than freshmen (111.85), level of education was not found to be significantly associated with overall critical thinking disposition. In this study, level of education was not a factor. Although this is not inconsistent with the literature, which has focused on factors such

as age and academic status, it is a finding that warrants further study and research.

One of the major implications of this study's results is the need to improve the critical thinking dispositions of agricultural communications students. Using the same cutoff point as the CCTDI, 2 (1%) of the participants in this study would be classified as having a strong disposition toward critical thinking, or a score higher than 136.95. However, using the low cutoff point of the CCTDI, a score lower than 108.9, 67 (30%) participants in this study would actually be classified as weak in critical thinking dispositions. If critical thinking dispositions–especially the engagement and innovativeness constructs–are requisite for agricultural communicators to excel in their profession, then it behooves agricultural communications educators and researchers to explore ways to activate and enhance critical thinking dispositions so as to improve their students' potential for future success.

As to the potential of the UF-EMI as a measurement of critical thinking disposition, results of the factor analysis showed that, of the three constructs used to measure dispositions, the innovativeness and engagement constructs were sufficiently strong, but the cognitive maturity construct was not, given its low reliability and inability to contribute to the rest of the instrument. An implication of this finding is that cognitive maturity may be a difficult construct to measure, especially with young adults; other researchers (Facione et al., 2001; Norris & Ennis, 1989) have reported difficulty measuring the cognitive maturity construct. Accordingly, this study reports the reliability of cognitive maturity as high as any other study reporting results from a critical thinking disposition instrument.

Recommendations

Recommendations that can be drawn from this study include conducting further research to determine the influence of gender more definitively and to explore the effect of level of education, when combined with related factors such as age and academic status. With respect to teaching effectiveness, these findings suggest an ongoing need for instructors to continue to work to enhance agricultural communications students' abilities to think critically. Specific recommendations include focusing curriculum on the teaching of critical thinking within the specific discipline of agricultural communications, as well as providing students with learning experiences designed to stimulate critical thinking and problem solving. Finally, based on the results of this study, it is recommended that work continue on the development and refinement of the UF-EMI as a measure of critical thinking disposition.

Within the specific context of agricultural communications, measuring students' critical thinking dispositions may be the first step toward ensuring that agricultural communications graduates are equipped with strong reasoning and thinking skills that will help them act, communicate, and educate effectively. By being aware of the critical thinking dispositions of agricultural communications students, faculty can design instruction that activates and cultivates their students' dispositions to help them become stronger, more reasoned thinkers, and consequently more sophisticated communicators for the agriculture industry.

About the Authors

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https://newprairiepress.org/jac/vol89/iss1/2
DOI: 10.4148/1051-0834.1300