

TEACHER CHARACTERISTICS EXPLAINING THE EXTENT OF AGRICULTURAL AWARENESS ACTIVITIES INTEGRATED INTO THE ELEMENTARY CURRICULUM

Neil A. Knobloch, Assistant Professor

University of Illinois

Robert A. Martin, Professor

Iowa State University

Abstract

The exploratory correlational-regression study investigated the extent that the variability in the number of agricultural awareness activities conducted by elementary teachers in east-central Iowa could be explained by selected teacher characteristics—degree of education, grade level, agricultural classes, agricultural experience, and perceptions toward integrating agriculture. A sample of 689 teachers was systematically drawn from the target population of 2,067 elementary teachers. A survey was conducted using a mailed questionnaire. Forty-five percent of the teachers (311/689) returned the questionnaire, but because some questionnaires were unusable, the data sample consisted of 281 questionnaires (41% response rate). The four teacher characteristics (Degree, Grade Level (K-2), Agricultural Classes, and Agricultural Experience) and the perception of integrating agriculture domain (integration perception) were entered into a stepwise, multiple linear regression model. The full model was significant ($p = .032$) excluding the independent variable—degree. The variables of integration perception, grade level (K-2), agricultural classes, and agricultural experience explained 20% of the variance in the number of agricultural awareness activities conducted. According to Cohen (1988), this relationship ($r^2 = .20$) had a large effect size. Unique variance was 7.8% for integration perception, 4.0% for grade level (K-2), 2.4% for agricultural classes, and 1.4% for agricultural experience.

Introduction

An integrated curriculum holds a promise to higher quality learning and greater achievement (Baily & Hughes, 1999; Bottoms, 1998; Grubb, 1999; Hoachlander, 1999; Lynch, 1999b; National Council for Agricultural Education, 1999; Southern Regional Education Board, 1999). Students experience greater success in learning when they connect the content to real world applications (Bottoms & Presson, 2000; Kaufman, Bradby, & Teitelbaum, 2000; Newmann & Wehlage, 1995; U.S. Department of Education, 1999). Because the agricultural, food, fiber and natural resources system is the largest employer in America and plays a significant role in the nation's economy (American Farm Bureau Federation, 1998), it provides a major

prospective context for learning in today's schools and classrooms. Therefore, the integration of agriculture in the elementary curriculum has been recommended by Birkenholz, Frick, Gardner, and Machtmes (1994); Leising and Zilbert (1994); Terry, Herring, and Larke (1992); and Frick, Birkenholz, and Machtmes (1995).

The philosophical base underpinning the need for agricultural awareness in elementary classrooms was based on Dewey's (1938) philosophy of experiential education. Dewey stated that, "anything which can be called a study, whether arithmetic, history, geography, or one of the natural sciences, must be derived from materials which at the outset fall within the scope of ordinary life experience" (p. 73). Further, Dewey expounded, "it is a sound educational principle that students should be introduced to scientific subject matter and be

initiated into its facts and laws through acquaintance with everyday social applications” (p. 80). Dewey believed that applying this method was the most direct avenue to understanding science, economic, and industrial problems in present society.

Dewey (1938) believed that students are largely the products of the application of science in production and distribution of commodities and services. Furthermore, Dewey posited that the process of “education through occupations” developed relationships among people and social groups. Fasheh’s (1990) description of a community-based education expanded on Dewey’s beliefs. Fasheh believed that the role of education in community transformation should be (a) informed by the real needs of the community, (b) creating a feeling of self-worth, empowerment, and self-acceptance, (c) to build human resources to be creative, life-long learners, and (d) to facilitate networking, communication, and the exchange of ideas and experiences among various groups. Further, Fasheh advocated that a curriculum be flexible and dynamic enough to provide a supportive environment for learners to develop their self-worth and respond to their various needs in a constantly changing environment. Feelings of self-worth should be connected to concrete things and to production that enhances life (Fasheh, 1990).

The social-economic activities of America have changed since Dewey’s assertions. As America’s economy, political culture, and society evolved from being agricultural-industrial to technological-informational, fewer citizens see the value of agricultural knowledge and the education of the agricultural, food, fiber and natural resources systems (De Christopher, 1993). Fasheh (1990) eloquently described this phenomena, “An education that responds to real needs, empowers people, builds networks, raises questions about assumptions and consequences, keeps oscillating between life and structures, and facilitates the transformation of mental and social structures is usually not compatible either with existing economic, political, and social orders or with the dominant values and mental patterns” (p. 34-35). However, it

is important that citizens in a democracy know and understand that the foundation of the economy and society rests on agricultural, food, fiber and natural resources systems because indigenous qualities of internal strength, “feeling at home” within the environment, and the ability to adapt to diverse conditions help species survive overtime (Fasheh, 1990). Therefore, agricultural, food, fiber and natural resources systems provide concrete and production-oriented topics worthy of study in today’s curriculum.

Mawby (1985) suggested “few issues are of greater importance to the world than adequate food supplies, proper food use, and knowledge about the components of the agricultural industry” (p. 7). Several educators have recommended for many years that agriculture should be taught in the elementary school curriculum (Fox, 1932; Herr, 1968; Keenan, 1970; Shively, 1936; Snowden & Shoemake, 1973; Swan & Donaldson, 1970). Recently, as a result of a strategic planning effort, the National Council for Agricultural Education (1999), stated that “agricultural education envisions a world where all people value and understand the vital role of agricultural, food, fiber and natural resources systems in advancing personal and global well-being” and that “agricultural education prepares students for successful careers and a lifetime of informed choices in the global agricultural, food, fiber and natural resources systems.” The National Council for Agricultural Education recommended that to achieve its vision and mission, agricultural education “must engage in a global social contract to serve the needs of society, improve the quality of the environment, build leadership and collaboration, and develop new approaches to new challenges.” Because 6% of the school population successfully completes agricultural coursework, teachers, agricultural groups, and educational organizations must collaborate to implement an integrated, contemporary agricultural-based curricula for the other 94% of students to have the knowledge required for a lifetime of informed choices in agricultural, food, fiber and natural resources systems

(National Council for Agricultural Education, 1999).

Currently, several researchers have researched Dewey's philosophy for integrated, thematic, applied, contextual, and authentic pedagogy. Lynch (1999a) found that citizens wanted career education and work skills included as critical components in the K-12 curriculum. Lynch found that students learned better when they were shown connections between that which must be learned and how it is used in the real world. "Most students need context to understand, learn, and remember" (Lynch, 1999a, p. 5.16). It is imperative that children be taught an integrated curriculum in their early years because "what is learned...how it is learned...and adapting in the early years is the greatest predictor for subsequent success in education and in workplaces" (Lynch, 1999a, p. 4.4). Good connections between the subjects taught in school, home, and communities during the early years comprise a critical foundation to continuing education and lifelong learning because the process of creating connections in the brain is most pronounced between the ages of 2 and 11 (Lynch, 1999a). Therefore, children need to be taught age-appropriate career information that connects education to applications in the real world (Lynch, 1999a).

Newmann and Wehlage (1995) found that authentic pedagogy helped students make connections to the world beyond the classroom. Authentic pedagogy boosted the academic performance of elementary, middle, and high school students equitably among all social backgrounds in both mathematics and social studies (Newmann & Wehlage, 1995). Authentic pedagogy promoted high quality intellectual work because it required students to think, develop in-depth understanding, and apply academic learning to important, realistic problems (Newmann & Wehlage, 1995). Instructional practices that promote quality-learning experiences for students commonly integrate academic content and the context of career, business, and technical studies. The U.S. Department of Education (1999) advocated that, "integration provides instruction in a meaningful, relevant setting that will improve student motivation,

and ultimately raise student achievement" (p. 9). Kaufman et al. (2000) found that students who perceived their academic and vocational teachers were working together had greater achievement in math, reading and writing skills. There were also some indications that students doing joint projects with both a vocational and academic teacher improved a school's academic achievement (Kaufman et al., 2000). All teachers in all schools must include the study of agriculture in a relevant, integrated instructional approach for all students to achieve conversational literacy in agricultural, food, fiber and natural resources systems (National Council for Agricultural Education, 1999). Specifically, the National Council for Agricultural Education (1999) identified two goals that will require inter-disciplinary integration among teachers: (a) "All students have access to seamless, lifelong instruction in agriculture, food, fiber and natural resource systems through a wide variety of delivery systems and educational settings," and (b) "all students are conversationally literate in agriculture, food, fiber and natural resource systems." Elementary and middle school teachers suggested that direct instruction about agricultural, food, fiber, and natural resources systems begin in the early elementary school curriculum and that a thematically-based, integrated curriculum would be an effective way to increase agricultural awareness in schools (Trexler, Johnson, & Heinze, 2000). Therefore, Agricultural awareness was operationally defined as experiencing or exploring agriculture as it relates to the subject matter being studied or context of life being lived, and the ability to identify the connections of agriculture to areas of study or life.

Agricultural educators have learned that teachers and students vary in their perceptions and knowledge of agriculture. According to some authors, elementary teachers have little knowledge of agriculture (Swan & Donaldson, 1970; Terry, Herring, & Larke, 1992). However, it has been shown that preservice elementary teachers, (Humphrey, Stewart, & Linhardt, 1994), elementary teachers (Knobloch & Martin, 2000a), and secondary education teachers (Harris & Birkenholz, 1996) were

knowledgeable of and had positive attitudes toward the industry of agriculture. Trexler et al. (2000) found that teachers believed schools play an important role in food system education. Although teachers believed that understanding the connections between humans and the environment was important, they acknowledged that students do not comprehend the food production, distribution, and preservation system and few teachers felt the need to educate students about the connections between people, soil, and food (Trexler et al., 2000). Trexler et al. (2000) found that elementary teachers perceived that their students did not understand where their food came from and did not care how it arrived at their meals. In addition, students lacked basic knowledge of agriculture according to Horn and Vining (1986, cited in Herren & Oakley, 1995) and had sketchy understandings of biological concepts related to pests (Trexler, 2000).

A teacher's background and experience play a significant role in educating students about agriculture. The literature indicates that teachers with agricultural experience had more agricultural knowledge and more accurate perceptions of agriculture (Humphrey et al., 1994; Terry et al., 1992). Further, preservice elementary teachers with agricultural experience were more confident in teaching agriculture (Humphrey et al., 1994) and had deeper understandings of pest-related concepts (Trexler & Heinze, 2000). Inexperience and unfamiliarity with agriculture and with teaching outside of the school hindered elementary teachers from integrating agricultural concepts into their curriculum (Trexler & Hikawa, 2000).

A teacher's knowledge, attitude, and expectations of a new curriculum are related to the amount of new curriculum taught (Rudd & Hillison, 1995). Furthermore, elementary teachers in Michigan were sometimes comfortable using the problem-solving method, connecting science teaching to community problems, and using agriculture as a context for science (Trexler & Suvedi, 1998). Moreover, these teachers moderately supported the concept that science can be taught through agricultural examples (Trexler & Suvedi, 1998). Balschweid, Thompson, and Cole (1998) found that K-12 teachers perceived their

students were most interested in animals, crops, and food processing. Trexler et al. (2000) found that elementary school teachers wanted to teach students how to make better consumer choices about their food. Elementary teachers in Texas taught agricultural knowledge and concepts approximately eight hours a year according to Terry et al. (1992) and elementary teachers in Iowa were using agricultural activities in their instruction (Knobloch & Martin, 2000a). However, Trexler et al. (2000) found that elementary school teachers made limited connections between the food system and the curriculum. Although elementary teachers taught issues related to agriculture, their class discussions did not contain agricultural, food, fiber, and natural resources systems content (Trexler et al., 2000).

Intervention programs with elementary teachers have seen some positive results. Trexler and Suvedi (1998) found that teacher perceptions of agriculture and confidence about integrating agriculture into science improved after a curriculum intervention program on science and agriculture. Moreover, teachers were more comfortable to integrate agricultural activities in the curriculum if they received background materials, educational training, resources, and support (Trexler et al., 2000). Balschweid et al. (1998) found that 90% of the elementary and secondary teachers who participated in an agricultural literacy in-service program integrated agriculture into at least one of their lessons. Wilhelm, Terry, and Weeks (1999) concluded that teachers who participated in the Oklahoma summer institute on Agriculture in the Classroom (AITC) integrated agriculture in their classrooms and used a wider variety of agricultural resources than non-participants. Herren and Oakley (1995) concluded that elementary teachers who were taught how to integrate AITC resources reported higher student achievement of agricultural concepts. On the other hand, insufficient training was a barrier to elementary teachers' progress in integrating agriculture into the curriculum (Trexler & Hikawa, 2000).

The role of the teacher has been very important for integrating agriculture in the

elementary curriculum (Terry et al., 1992). Tenably, if teachers are change agents for integrating agriculture into the elementary curriculum, then their characteristics and perceptions would affect the extent of integrating agriculture into the elementary curriculum. This study was based on the premise that “values, attitudes, needs, and wishes, as well as impulses and motives, are projected upon objects and behaviors outside of the individual” (Kerlinger, 1973, p. 514). Therefore, people perceive the world through their own set of values, beliefs, attitudes, and intentions, which lead to behaviors (Fishbein & Azjen, 1975). Although some researchers (Humphrey et al., 1994; Terry et al., 1992; Trexler & Heinze, 2000; Trexler & Hikawa, 2000; Trexler et al., 2000) studied pre-service and in-service elementary teachers’ knowledge and perceptions of agriculture, the agricultural education profession has not sufficiently investigated elementary teachers’ characteristics and their perceptions toward integrating agriculture into the curriculum related to the extent they conducted agricultural activities in their pedagogy.

Purpose and Objectives

The purpose of this study was to explore teacher characteristics explaining the extent of integrating agriculture into the elementary curriculum. The objectives addressed were to: (a) describe the teachers in the population based on selected characteristics; and (b) explain the percent of variability in the sum of variables related to the number of agricultural awareness activities conducted related to selected characteristics of elementary teachers in east-central Iowa. The independent variables investigated in the study were degree of education, grade level, agricultural classes, agricultural experience, and perceptions toward integrating agriculture. The dependent variable of this study was the number of agricultural awareness activities conducted.

Procedures

The target population of the study was

elementary teachers in a seven county educational service area in east-central Iowa. There were 52 school districts in the target population. The districts ranged in size from being small with six students to the second largest school district in Iowa with over 17,000 students. The mean size of the school districts in the sample was 5,725 students per district. The Grant Wood Area Education Agency mailing list of teachers served as the frame. There were 2,067 teachers in the frame who taught in 33 public school districts and 19 private school districts. An equal-probability-of-selection method sample of 689 teachers was selected using a systematic sampling method (Babbie, 1990).

The instrument used to collect the data for this study was a mailed questionnaire containing 72 items in three parts. The researchers created the instrument (Knobloch, 1997). Part 1 contained 14 items related to beliefs about integrating agriculture into elementary classes. Perceptions were measured using a 5-point summated rating scale. Teachers were asked to respond to each statement using the following rating scale: Strongly Disagree (SD = 1), Disagree (D = 2), Neutral (N = 3), Agree (A = 4), and Strongly Agree (SA = 5). Part 2 contained 48 items regarding agricultural activities in the classroom (Knobloch & Martin, 1998). The activities related to general agriculture and the seven career areas of agriculture—agricultural mechanics, agricultural processing, agricultural production, agricultural sales and services, forestry, horticulture, and natural resources and conservation (Newcomb, McCracken, & Warmbrod, 1993). The teachers were asked to respond to the number of times that they had conducted the activities in their instruction during the past year. Their choices were Never = 0, Once a year = 1, Twice a year/once a semester = 2, and Three or more times a year = 3. Part 3 contained 10 items related to demographic information and teacher characteristics.

Content and face validity were established by a panel of elementary teachers, a school superintendent, a professional accountant, and faculty members of the Department of Agricultural

Education and Studies at Iowa State University. Items related to the agricultural activities were teaching ideas developed by elementary teachers in the Iowa Teachers' Academy on Agricultural Awareness workshops. The instrument was reliable (Nunnally, 1967) because it yielded a post hoc Cronbach's alpha of .88 for the items related to Integration of Agriculture.

Questionnaires were sent to the elementary teachers at their school addresses. A follow-up postcard was sent as a reminder 10 days after the initial mailing. Forty-five percent of the teachers (311/689) returned the questionnaire. Because some questionnaires were returned blank or partially completed, the data sample consisted of 281 questionnaires (41% response rate). One plausible reason for the lower response rate was because there was not enough time to send subsequent follow-up reminders due to the end of the school year. Non-response error was controlled by the "double-dip" method (Miller & Smith, 1983). Five percent of the non-respondents were randomly sampled. Their responses were compared to respondents using summated means. *T-tests* indicated no significant differences between the non-respondents' and respondents' responses on 10 randomly selected items.

Analysis of Data

Correlational-regression statistics were used to analyze the data. The data set was analyzed using SPSS. Negatively worded items were reverse coded in the summations of the conceptual perception domain. Summated means and standard deviations were calculated for the composite score of the overall attitude of elementary teachers toward the integration of agriculture and the total number of agricultural awareness activities conducted. Stepwise multiple linear regression statistics were used to analyze the data. Categorical independent variables were dummy coded. Relationships were described using the Pearson product-moment coefficient. Means and standard deviations were reported with each coefficient. The alpha level was established a priori at .05. Effect size was calculated

and interpreted using Cohen's (1988) criteria.

Results

Ninety percent ($n = 274$) of the teachers were female and 10% were male ($n = 27$). Sixty-two percent ($n = 171$) of the teachers had a bachelor's degree and 38% ($n = 103$) of the teachers had a master's degree. The grade levels taught by the elementary teachers were 38% for kindergarten through second grade and 62% for third to sixth grades. The years of teaching experience of the teachers in the sample were evenly distributed among the categories of teaching experience. Thirty-nine elementary teachers (14%) had taken agricultural classes, workshops, or in-service programs. One hundred fifty-six elementary teachers (57%) had agricultural experience. Half of the teachers ($n = 136$) in the sample taught in rural community; one-fourth ($n = 67$) taught in a metropolitan community; and one-fourth ($n = 67$) taught in an urban community. Many teachers taught more than one grade level and more than one subject. Elementary teachers had positive perceptions regarding integrating agriculture into the elementary curriculum. The integration of agriculture domain represented 14 items related to the integration of agriculture into the elementary curriculum, e.g., agriculture would enhance the curriculum; there is no time to teach agriculture in the elementary curricula; agriculture can be taught in any subject matter area; and, elementary school teachers are not trained to teach agriculture. The mean of this domain was 3.74 ($SD = 0.44$). Two hundred twenty-eight teachers (81%) indicated that they had conducted agricultural activities in their instruction at least once during the school year. In general, elementary teachers conducted 40 agricultural awareness activities in their curriculum during the school year reported. Some examples of the activities were recycled paper and discussed renewable resources; discussed an agricultural issue about the environment; viewed birds or wildlife; identified types of trees in a forest;

and, identified the ingredients from a food label.

In a prior study (Knobloch & Martin, 2000b), relationships between four selected teacher characteristics were found to be significant with the number of agricultural awareness activities conducted (Table 1). The four teacher characteristics (degree, grade level (K-2), agricultural classes, and agricultural experience) and the perception of integrating agriculture domain (integration perception) were entered into a stepwise, multiple linear regression model (Table 2). The full model was significant ($p = .032$) excluding the independent variable-degree. The variables of integration

perception, grade level (K-2), agricultural classes, and agricultural experience explained 20% of the variance in the number of agricultural awareness activities conducted. This relationship ($r^2 = .20$) had a large effect size (Cohen, 1988). Integration perception accounted for 7.8% unique variance, grade level (K-2) accounted for 4% unique variance, agricultural classes accounted for 2.4% unique variance, and agricultural experience accounted for 1.4% unique variance. An examination of the residuals showed the assumptions were not violated. Furthermore, there was no concern of multicollinearity (lowest tolerance factor = .928; highest VIF = 1.07).

Table 1

Intercorrelations Between Characteristics and Variables for Elementary Teachers (n = 261)

Variables	X ₁	X ₂	X ₃	X ₄	X ₅	Y ₁	M	SD
Degree of Education (X ₁)	-	.06	.13	-.06	.03	.13	.36	.48
Grade Level ¹ (X ₂)		-	-.01	-.05	.15	.24	.38	.49
Agricultural Classes ² (X ₃)			-	.09	.15	.21	.14	.35
Ag. Experience ³ (X ₄)				-	.17	.18	.57	.50
Integration Perception (X ₅)					-	.36	3.74	.44
Activities Conducted (Y ₁)						-	39.54	22.40

Note. The perception scale for X₅: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

¹Grade Level: 0 = Grades 3-6; 1 = Grades K-2

²Agricultural Classes & ³Agricultural Experience: 0 = No; 1 = Yes

Table 2

Summary of Stepwise Regression Analysis for Variables Explaining Agricultural Awareness Activities Conducted by Elementary Teachers ($n = 261$)

Variable	<i>B</i>	<i>SE B</i>	\exists	<i>t</i>	<i>p</i>
Integration Perception	14.82	2.96	.29	5.01	<.01
Grade Level ¹	9.25	2.59	.20	3.58	<.01
Agricultural Classes ²	10.10	3.62	.16	2.79	<.01
Agricultural Experience ³	5.52	2.56	.12	2.16	.03
(Constant)	-24.09				

Note. Full Model: $R^2 = .21$; Adjusted $R^2 = .20$; $F = 16.81$; $p = .032$

¹Grade Level: 0 = Grades 3-6; 1 = Grades K-2

²Agricultural Classes & ³Agricultural Experience: 0 = No; 1 = Yes

Conclusions and Recommendations

Elementary teachers in this study had positive perceptions about integrating agriculture into their pedagogy and curriculum. This finding was consistent with the recommendation that agriculture should be integrated into the elementary curriculum (Birkenholz et al., 1994; DeChristopher, 1993; Dewey, 1938; Frick et al., 1995; Leising & Zilbert, 1994; Lynch, 1999a; National Council for Agricultural Education, 1999; National Research Council, 1988; Terry et al., 1992; Trexler et al., 2000). The regression model was congruent with Fishbein and Ajzen's (1975) theory, which supports the implication that elementary teachers with positive beliefs about the consequences of integrating agriculture leads to positive attitudes and subjective norms, thus, leading to intentions and behaviors of integrating agriculture into their instruction. Therefore, the elementary teachers' positive perception of the integration of agriculture into their curriculum and pedagogy tenably explained why many teachers conducted agricultural activities in their instruction.

The characteristics of elementary teachers that explained 20% of the variance in the number of agricultural activities

conducted in the elementary curriculum were their perceptions toward integration, if they taught grades K-2, if they had taken agricultural classes or workshops, and if they had agricultural experience. The finding that elementary teachers with positive perceptions of integrating agriculture into their curriculum were more likely to conduct agricultural activities in their classrooms supported research conducted by Rudd and Hillison (1995), who found that teachers' attitudes related to the amount of new curriculum that was taught. Elementary teachers' perception about integration was the most significant variable explaining the extent which agricultural activities were integrated into the curriculum. Further, elementary teachers who taught in the lower grade levels were more likely to integrate agriculture in their instruction and was consistent with findings by Trexler et al. (2000) and Lynch (1999a). The finding that teachers who have participated in agricultural classes, workshops, or intervention education programs was consistent with the findings of Balschweid et al. (1998), Trexler and Suvedi (1998), Trexler et al. (2000), and Wilhelm et al. (1999). Moreover, the finding that agricultural experience contributed to teachers more likely to integrating

agriculture in their instruction related to Humphrey et al.'s (1994) conclusion that teachers with agricultural experience were more confident in teaching agriculture, and that experience relates with deeper conceptual understanding (Trexler & Heinze, 2000).

The findings and conclusions of this study should be considered in the development of intervention programs for preservice and inservice teachers, by teacher education programs, agriculture teachers, and state department of education consultants. Using the regression equation from this study, it can be predicted that elementary teachers in east-central Iowa with a positive perception towards integration, K-2 teaching involvement, participation in agriculturally related classes or workshops, and agricultural experience would conduct approximately 60 agricultural activities in their curriculum and instruction in an academic year (Estimated Number of Agricultural Activities = $-24.09 + (14.82)(\text{Perception}) + (9.25)(\text{K-2 Teacher}) + (10.10)(\text{Ag. Class}) + (5.52)(\text{Ag. Experience})$). Moreover, commodity organizations, agricultural promotion groups, and elementary education programs such as Agriculture in the Classroom and Food, Land, and People should consider developing resources and programs for elementary teachers that relate to their perceptions, grade levels, agricultural experiences, and education in agriculture. For example, these organizations and groups should collaborate with agricultural educators, such as professors and state specialists, who are experts in agricultural awareness and literacy in developing agricultural in-service education and experience programs, especially targeted to improve the perception toward integration of elementary teachers who teach in the lower elementary grades.

This study should be replicated in other states to determine if the findings vary because of geographical differences, economic changes and societal influences. Further study should investigate personal and environmental factors that reciprocally determine integration of agriculture in the curriculum. Further study is needed to assess how elementary teachers believe that

agriculture could be best integrated into their instruction, especially in grade 3 or higher. A factor analysis of the instrument should be investigated for further instrument development. Future research studies should be conducted to identify barriers to integrating agriculture into the elementary curriculum and to explain student achievement associated with the integration of agriculture in the elementary curriculum.

References

- American Farm Bureau Federation. (1998). *Farm facts for the record*. Retrieved February 14, 2000 from <http://www.fb.org/today/farmfacts/ft.html>
- Babbie, E. (1990). *Survey research methods*. Belmont, CA: Wadsworth Publishing Company.
- Baily, T. & Hughes, K. (1999). The prospects for work-based learning. *CenterWork*, 10(3-4), 17.
- Balschweid, M. A., Thompson, G. W., & Cole, R. L. (1998). The effects of an agricultural literacy treatment on participating K-12 teachers and their curricula. *Journal of Agricultural Education*, 39(4), 1-10.
- Birkenholz, R., Frick, M., Gardner, H., & Machtmes, K. (1994). Rural and urban inner-city school student knowledge and perception of agriculture. *Proceedings of the 21st National Agricultural Education Research Meeting Dallas, TX*, 21, 130-136.
- Bottoms, G. (1998). *Things that matter most in improving student learning*. Atlanta, GA: Southern Regional Education Board.
- Bottoms, G., & Presson, A. (2000). *Finishing the job: Improving the achievement of vocational students*. Atlanta, GA: Southern Regional Education Board.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale, NJ: Lawrence Erlbaum Associates.

DeChristopher, R. (1993, November 13). Where does food come from? *Iowa Farmer Today*, p. 15.

Dewey, J. (1938). *Experience and education*. New York: Collier Books.

Fasheh, M. (1990). Community education: To reclaim and transform what has been made invisible. *Harvard Educational Review*, 60(1), 19-35.

Fishbein, M., & Azjen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MS: Addison-Wesley Publishing Company.

Fox, L. (1932). Agriculture in the grades. *Virginia Journal of Education*, 25, 272-274.

Frick, M., Birkenholz, R., & Machtmes, K. (1995). Rural and urban adult knowledge and perceptions of agriculture. *Journal of Agricultural Education*, 36(2), 44-53.

Grubb, W. N. (1999). Keeping the faith: The prospects for "education through occupations." *CenterWork*, 10(3-4), 13.

Harris, C. R., & Birkenholz, R. J. (1996). Agricultural literacy of Missouri secondary school educators. *Journal of Agricultural Education*, 37(2), 63-71.

Herr, R. D. (1968). Instruction in agriculture for elementary school students. *The Agricultural Education Magazine*, 41(4), 96-97.

Herren, R. V., & Oakley, P. (1995). An evaluation of Georgia's agricultural in the classroom program. *Journal of Agricultural Education*, 36(4), 26-31.

Hoachlander, G. (1999). More than a name change? Transitioning from vocational to career and technical education. *CenterWork*, 10(3-4), 2-4.

Humphrey, J. K., Stewart, B. R., & Linhardt, R. E. (1994). Preservice

elementary education majors' knowledge of and perceptions toward agriculture. *Journal of Agricultural Education*, 35(2), 27-30.

Kaufman, P., Bradby, D., & Teitelbaum, P. (2000). *High schools that work and whole school reform: Raising academic achievement of vocational completers through the reform of school practice*. Berkeley, CA: National Center for Research in Vocational Education, University of California

Keenan, R. G. (1970). Teaching elementary pupils about agriculture. *The Agricultural Education Magazine*, 43(4), 90-91.

Kerlinger, F. N. (1973). *Foundations of behavioral research*. New York, NY: Holt, Rinehart, and Winston.

Knobloch, N. A. (1997). *Perceptions regarding integration of agricultural awareness activities by elementary teachers in east central Iowa*. Unpublished master's thesis, Iowa State University, Ames.

Knobloch, N. A., & Martin, R. A. (1998). Perceptions regarding integration of agricultural awareness activities into the curriculum by elementary teachers. *Proceedings of the 25th National Agricultural Education Research Meeting*, New Orleans, LA, 25, 385-398.

Knobloch, N. A., & Martin, R. A. (2000a). Agricultural awareness activities and their integration into the curriculum as perceived by elementary teachers. *Journal of Agricultural Education*, 41(4), 15-26.

Knobloch, N. A., & Martin, R. A. (2000b). Relationships of elementary teachers' perceptions and activities conducted regarding the integration of agricultural awareness activities into the curriculum. *Proceedings of the 27th National Agricultural Education Research Conference*, San Diego, CA, 27, 207-220.

Leising, J., & Zilbert, E. (1994). Validation of the California agriculture literacy framework. *Proceeding of the 21st*

National Agricultural Education Research Meeting, 112-119.

Lynch, R. L. (1999a). *A vision of high school career and technical education for the 21st century*. Unpublished manuscript.

Lynch, R. L. (1999b). Response: More than a name change? *CenterWork*, 10(3-4), 6.

Mawby, R. (1985). Foreword. In G. K. Douglas (Ed.), *Cultivating agricultural literacy: Challenge for the liberal arts*. Battle Creek, MI: W. K. Kellogg Foundation.

Miller, L. & Smith, K. (1983). Handling nonresponse issues. *Journal of Extension*, 21(S/O), 45.

National Council for Agricultural Education. (1999). *A new era in agriculture: Reinventing agricultural education for the year 2020*. Alexandria, VA: Author.

National Research Council. (1988). *Understanding agriculture: New directions for education*. Washington, DC: National Academy Press.

Newcomb, L. H., McCracken, J. D., & Warmbrod, J. R. (1993). *Methods of teaching agriculture*. Danville, IL: Interstate Printers and Publishers.

Newmann, F. M., & Wehlage, G. G. (1995). *Successful school restructuring: A report to the public and educators by the Center on Organization and Restructuring of Schools*. Madison, WI: Center on Organization and Restructuring of Schools.

Nunnally, J. C. (1967). *Psychometric theory*. New York, NY: McGraw-Hill.

Rudd, R. D., & Hillison, J. H. (1995). Teacher characteristics related to the adoption of agriscience curriculum in Virginia middle school agricultural education programs. *Journal of Agricultural Education*, 36(2), 19-27.

Shively, W. H. (1936). Teaching objective for agriculture in the elementary schools. *The Agricultural Education Magazine*, 8(7), 101, 103.

Snowden, O. L., & Shoemaker, R. G. (1973). Elementary programs for career education in agriculture. *The Agricultural Education Magazine*, 45(7), 149-150, 153.

Southern Regional Education Board. (1999). *Making schools work: Raising student achievement in rural middle grades and high schools*. Atlanta, GA: Author.

Swan, M. D., & Donaldson, G. W. (1970). The agricultural educator's role in helping elementary pupils learn about agriculture. *The Agricultural Education Magazine*, 42(11), 282-283.

Terry, R., Jr., Herring, D. R., & Larke, A., Jr. (1992). Assistance needed for elementary teachers in Texas to implement programs of agricultural literacy. *Journal of Agricultural Education*, 33(2), 51-60.

Trexler, C. J. (2000). A qualitative study of urban and suburban elementary student understandings of pest-related science and agricultural education benchmarks. *Journal of Agricultural Education*, 41(3), 89-102.

Trexler, C. J., & Heinze, K. L. (2000). Prospective elementary teachers understandings of pest-related science and agricultural education benchmarks. *Journal of Agricultural Education*, 41(1), 81-94.

Trexler, C. J., & Hikawa, H. (2000). Elementary and middle school agriculture curriculum development: An account of teacher struggle at countryside charter school. *Journal of Agricultural Education*, 42(3), 54-64.

Trexler, C. J., Johnson, T., & Heinze, K. (2000). Elementary and middle school teacher ideas about the agri-food system and their evaluation of agri-system stakeholders' suggestions for education. *Journal of Agricultural Education*, 41(1), 30-38.

Trexler, C. J., & Suvedi, M. (1998). Perception of agriculture as a context for elementary science teaching: A case of change in Sanilac County, Michigan. *Journal of Agricultural Education*, 39(4), 28-36.

Wilhelm, A., Terry, R., & Weeks, W. (1999). Comparison of elementary teachers' use of agriculture in their teaching. *Proceedings of the 26th National*

Agricultural Education Research Conference, Orlando, CA, 26, 63-76.

U. S. Department of Education. (1999). *Key high school reform strategies: An overview of research findings*. Washington, D. C.: Office of Vocational and Adult Education. Retrieved November 4, 2000 from <http://www.ed.gov/offices/OVAE/nahs/research.html>