

Oregon's Secondary Agricultural Education Teachers' Level of Computer-based Technology Integration

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Abstract

The focus of this research was to examine the relationship between the Oregon secondary agricultural education teachers' level of computer-based technology integration and selected demographic variables. Correlational analysis of the level of computer-based technology integration and the following demographic variables was conducted: (a) age, (b) gender, (c) education level, (d) years of teaching, (e) school size, (f) high-speed Internet at home, and (g) computer at home. The data were collected during April-May of the 2007 academic school year. The research instruments consisted of the Kotrlik/Redmann Technology Integration Scale (KRTIS). The data were analyzed using descriptive and correlational research techniques. The response rate for the study was 97.5%. The research indicated that the Oregon agricultural education teachers were most active in the phase of adoption – using computer-based technology and least active in the area of experimentation – beginning to use computer-based technology. Correlational analysis of the level of computer-based technology integration and selected demographic variables also failed to produce a significant relationship and degree of correlation.

Introduction

The State of Oregon, attempting to meet the National Educational Technology Standards for Teachers (International Society for Technology in Education [ISTE], 2002; Oregon Department of Education [ODE], 2002), has established technology common curriculum goals that encourage school districts to establish their own individual content standards and benchmarks in technology. The Oregon State Board of Education adopted common curriculum goals in technology in March 2002:

1. Demonstrate proficiency in the use of technological tools and devices.
2. Select and use technology to enhance learning and problem solving.
3. Access, organize, and analyze information to make informed decisions, using one or more technologies.
4. Use technology in an ethical and legal manner and understand how technology affects society.
5. Design, prepare, and present unique works using technology to communicate information and ideas.
6. Extend communication and collaboration with peers, experts, and other audiences using telecommunications. (ODE, 2002, p. 1)

The fulfillment of Oregon's common curriculum goals in technology would bring the state into compliance with the National Educational Technology Standards for Teachers adopted

by the ISTE (ODE, 2002). The Oregon Department of Education (2002, 2006) has identified technology as essential in both the teacher's delivery of instruction and the student's education.

Kotrlik et al. (2003) stressed the need for additional research in the area of technology integration in the secondary agricultural education environment. The recommendation was given to the research community to identify the "factors related to technology integration in the teaching/learning process" (p. 88). This study expanded the current research base and identified the Oregon agricultural education teacher's level of integration of computer-based technology. The study provides a needs assessment by isolating the level of computer-based technology integration and will allow educational leaders to determine a future course of action for professional development (Anglin, 1995; Kise, 2006) and program improvements in an attempt to meet educational standards (NCLB, 2002; ODE, 2002). The study also identified if a relationship existed between the secondary agricultural education teacher's current level of computer-based technology integration (Kotrlik et al., 2003) and selected demographic variables.

Theoretical Framework

The constructivist learning theory (Piaget, 1973) provides the theoretical framework for utilizing computer-based technology within instructional settings. Constructivist theory implies that students learn by doing, building, making meaning out of individual experiences both past and present, and constructing an understanding within their current environment. The constructivist theory of learning is based upon the works of Bruner (1960), Dewey (1938), Piaget (1973), and Vygotsky (1930/1978). These authorities were used to establish part of the philosophical base for the theoretical framework that guided the research project.

Dewey (1938) professed that learning in the traditional rote memorization approach only provided superficial learning with little lasting effect. His theory was built on the tenets that knowledge is based on active participation and involved experience. Further, the educational system should be established to improve the cognitive process as applied to problem solving. Dewey proposed that knowledge of the learner was built around the educational experience, and individual discovery led the way. He viewed learning as a dynamic process and recommended that students should be placed in a situation where they are given a chance to explore their world and make meaning out of active participation.

Piaget (1973) placed focus on the learning of children and the cognitive processes that shape their knowledge acquisition; he subsequently developed the hierarchy of thinking stages: sensorimotor, preoperational, concrete, and formal. Piaget did not set rigid parameters around the four thinking stages, but used them as a way of provoking discussion on how children learn (Goldman-Segall & Maxwell, 2003). Learning in the child occurs at a greater rate when the child explores, examines, theorizes, and then confronts the unknown of the world, thus making meaning out of her or his current environment. Piaget's theories, revolutionary for his time, provide support for instructional technologies of the 21st Century (Papert, 1993). As a student uses the computer, he or she is making meaning out of the unknown by building upon her or his previous experience and knowledge (Papert; Piaget). Piaget set the foundation, and others elaborated on the constructivist thought.

Vygotsky (1930/1978), early in the twentieth century, examined the social component of learning with emphasis in language, writing, and culture. He suggested that learning took place at all times; as students share and discuss current problems, they develop skills and increase their learning. The comparison of Vygotsky's work to that of Piaget (1973) illustrated that they built upon similar components. Vygotsky focused on the social component of learning, and Piaget on the individual mind of the child. From Vygotsky's point of view, the learner should establish her or his own meaning in a social context and share that reality with those in her or his community. Vygotsky developed the concept of the "zone of proximal development" (p. 86) where the child is constantly expanding her or his zone of knowledge and problem solving skills.

Papert (1993) illustrated that use of instructional technologies in a social context provides feedback that indicates their effectiveness in the educational learning environment. The computer can be used as an instructional tool to complement the educational environment. The World Wide Web, video conferencing, email, and web cams provide an extended social learning community.

The theory of constructivism empowers the individual learner to construct meaning out of the environment. The tools provided by computer-based technology enable the learner to be engaged in an educational environment and assimilate knowledge into her or his world. Computer-based instructional technology has the potential to reward and provide feedback to the student and teacher. In doing so, the participant is motivated to continue in the educational process. The interactive nature of computer-based technology supports the philosophy of constructivism (Papert, 1993). The implications for the research are that constructivism allows for progressive teaching practices utilizing real-world tools more than the drill and practice methods of early computer-based technologies utilized by educators.

Objectives

The focus of the research was to examine the relationship between the Oregon secondary agricultural education teachers' level of computer-based technology integration and selected demographic variables. The research objectives were as follows:

1. To determine the demographic profile of Oregon's secondary agricultural education teachers concerning: (a) age, (b) gender, (c) education level, (d) years of teaching, (e) school size, (f) high-speed Internet at home, and (g) computer at home.
2. To determine the current level of computer-based technology integration by the Oregon secondary agricultural education teachers.
3. To determine the level of association between selected demographic variables and the secondary agricultural education teacher's level of computer-based technology integration.

Methods/Procedures

The study utilized a web and mail base survey-type questionnaire administered to the secondary agricultural education teachers in the State of Oregon. The questionnaire contained the KRTIS (Kotrlik et al., 2003).

Descriptive survey methods were used to gather the data regarding the teacher's level of computer-based technology integration and teacher's demographic information. The population for this study included all secondary agriculture teachers in the State of Oregon who were employed and teaching agriculture during the 2006-2007 academic year. The entire population was selected for participation in this study rather than a sample due to the relatively small population size ($N = 121$) and ease of accessibility. The study concluded with a 97.5% response rate.

The Kotrlik/Redmann Technology Integration Scale identifies four phases of activity in the technology integration spectrum: (a) exploration, (b) experimentation, (c) adoption, and (d) advanced integration. As teachers progress in their level of technology integration, they move from phase to phase of integration (Kotrlik et al., 2003). The KRTIS produced nominal data that allowed for categorical classification for statistical analysis (Courtney, 2006, 1988). The Cronbach's Alpha Reliability Coefficient for the KRTIS has an exemplary level of reliability the alpha of Exploration $\alpha = 0.84$, Experimentation $\alpha = 0.90$, Adoption $\alpha = 0.96$, and Advanced Integration $\alpha = 0.90$ (Kotrlik et al., 2003).

A panel of experts and pilot group provided feedback on the face and content validity of the instrument. Minor changes were made to the wording to produce clarity to the end reader. The analysis of the KRTIS instrument was only conducted to determine the overall reliability of the completed questionnaire and not as an effort to disprove the work of Kotrlik/Redmann. The results of the Cronbach's alpha reliability coefficients analysis of the pilot test produced an acceptable level of reliability the $\alpha = .92$ which is similar to the Cronbach's alpha reported by Kotrlik et al. (2003) that ranged from α of .84 – .96. The results of the reliability and validity analysis were deemed appropriated and the questionnaires were prepared for delivery to the population.

To determine the level of correlation between the secondary agriculture teacher's level of computer-based technology integration and the selected demographic variables of: (a) age, (b) gender, (c) education level, (d) years of teaching, (e) school size, (f) high-speed Internet at home, and (g) computer at home, the Pearson product-moment correlation coefficient was used to determine the level of significance and the level of correlation. The sum of the KRTIS integration scale was used as the continuous variable to determine the level of integration (Kotrlik et al., 2003). The demographic variables were used as correlational variables for the Pearson correlations (Alston, 2003).

Results/Findings

Tables 1 through 6 present the means, standard deviations, frequencies, and percentages for the demographic / personal variables contained in the survey instrument. Table 1 presents demographic data of age and gender for the secondary agricultural education teachers in the State of Oregon. The secondary agricultural education teachers in the State of Oregon who participated in the study ($N = 118$) reported a mean age of 33. Two-thirds (66.9%) of the participants in the study were male, and one-third (33.1%) were female.

Table 1

Age and Gender of the Respondents (N = 118)

Age (N = 118):	Frequency	Mean	SD
Agricultural Education Teachers	118	33.0	11.7

Gender (N = 118):	Male	Female	Total
Agricultural Education Teachers Total	79	39	118
Percentage	66.9%	33.1%	

The distribution by racial and ethnic identity of the secondary agricultural education teachers in the State of Oregon was very one dimensional with $N = 116$ (98.3%) of the participants representing the “White” racial group. Two (1.7%) respondents were identified as “Hispanic.” There were no participants who reported that their racial/ethnic identity was described as “African,” “Asian,” “Middle Eastern,” “Native American,” or “Other.”

The participants in this study were asked to provide their highest level of education attained (Table 2). Ninety-four (79.7%) of the secondary agricultural education teachers in this study had at least a masters degree and 24 (20.3%) held a bachelor’s degree. Thirty-two (27.1%) of the teachers had a masters degree plus 30 credits, and one (.85%) participant had a doctorate degree.

Table 2

Highest Degree Earned by Respondents (N = 118)

Educational degree earned	Frequency	Percent
Bachelor	24	20.3%
Masters	61	51.7%
Masters plus 30 credits	32	27.1%
Doctorate	1	0.9%
Total	118	100%

Note. Frequency = number of agriculture teachers who earned the respective degrees

Teachers were also asked how many years of experience they had teaching agricultural education (Table 3). Seventy-four (62.7%) teachers had been teaching 10 years or less; of these 74 teachers, 34 (28.8%) had been teaching less than four years. Twenty-two (18.6%) of the teachers had been in the profession between 11 - 20 years, and 22 (18.6%) of the participants had 21 or more years of service.

Table 3

Years of Teaching Experience of the Respondents (N = 118)

<u>How many years have you taught agricultural education?</u>		
<u>Years taught</u>	<u>Total</u>	<u>Percent</u>
First Year	11	9.3%
1-3 Years	23	19.5%
4-10 years	40	33.9%
11-20 years	22	18.6%
21+ years	22	18.6%
Total	118	100%

The teachers were asked what the population of students was within their school (Table 4). Forty-one (34.8%) of the respondents were employed in a school with less than 250 students. The data presented 24 (20.3%) teachers who were teaching within schools of 251 to 500 students, and 24 (20.3%) teachers were in a school with 500 to 1,000 students. Schools with the population between 1,000 and 1,500 students represented the smallest proportion of teachers 14 (11.9%). The largest schools containing more than 1,500 students had 15 (12.7%) teachers in the study.

Table 4

Student Enrollment Population at Participating Schools (N = 118)

<u>Population of School</u>	<u>Total</u>	<u>Percent</u>
Less than 250 students	41	34.8%
Between 251 and 500 students	24	20.3%
Between 500 and 1,000 students	24	20.3%
Between 1,000 and 1,500 students	14	11.9%
More than 1,500 students	15	12.7%
Total	118	100%

In addition to personal and demographic variables, the secondary agricultural education teachers were asked to indicate curricular subjects that they had taught within the last two years, other than agricultural or natural resources related curriculum. Table 5 provides frequencies and percentages of the number of agriculture teachers teaching non-agricultural curricula as part of their assigned instructional duties. The research instrument did not ask the participants the total number of courses in a given curricular area.

The participants had taught a variety of non-agricultural courses in vocationally related areas and traditional academic curricula. The closely related vocational curriculum areas consisted of welding, woodworking, construction, automotive, and drafting/auto CAD. There were five vocational curriculum areas that would be considered separate and independent from the agricultural education curriculum (e.g., computer applications, technology education,

business, health occupations, and family and consumer sciences), and nine core academic and other curricula areas ranging from leadership to career education.

Table 5

Respondents' Instructional Assignment of Non-agricultural Related Curriculum (N = 118)

<u>What other teaching assignments have you had in the last two years?</u>		
	Frequency	Percent of total teachers (N = 118)
<u>Closely related vocational curricula</u>		
Welding other than Agricultural Mechanics	42	35.6%
Woodworking/carpentry other than Agricultural Mechanics	29	24.6%
Construction other than Agricultural Mechanics	14	11.9%
Automotive other than Agricultural Mechanics	6	5.1%
<u>Vocational curricula independent from the agricultural education curriculum</u>		
Computer Applications	10	8.5%
Technology Education	5	4.2%
Business	3	2.5%
Health Occupations	2	1.7%
Family and Consumer Sciences	1	0.8%
<u>Core academic and/or other curricula</u>		
Leadership	23	19.5%
Science	19	16.1%
Math	14	11.9%
English	3	2.5%
Social Studies	3	2.5%
Physical Education	2	1.7%
Special Education	1	0.8%
Fine Arts (Music, Art)	0	0.0%
Foreign Language	0	0.0%
<u>Other self-identified subjects:</u>		
Senior Transition	5	4.2%
Drafting/Auto CAD	4	3.4%
Career Education	2	1.7%
Total	188	

Note. Frequency = number of teachers per curricular area

The agricultural education teachers reported “Welding other than agricultural mechanics” more than any other curricular area with a frequency of 42 (35.6%), followed by “Woodworking/carpentry other than agricultural mechanics” with a frequency of 29 (24.6%). The most frequent non-agricultural curricula taught in the core academic and/or non-vocational related curriculum was leadership with 23 (19.5%) teachers responding, science had 19 teachers respond (16.1%), and the curriculum area of math produced 14 (8.5%) participants indicating that they had taught math in the last two years.

Demographic data concerning home computer and Internet access were collected. The participants were asked if they had high-speed Internet at home and asked to indicate if they had a computer at home. Table 6 presents the frequencies for high-speed Internet access at home for the agricultural education teachers. A majority, 68 (61.3%) of the teachers, had high-speed Internet in their homes. Forty-three (38.7%) of the teachers reported having dial-up or slow Internet connection in their homes. Ninety-four percent ($N = 111$) of the participants had a computer at home.

Table 6

Computer Access and Internet Connection at Home of Respondents (N = 118)

Do you have cable, satellite or DSL Internet connection at home?					
	Yes	Percent	No	Percent	Total
High-speed Internet	68	61.3%	43	38.7%	111
Computer at home	111	94.1%	7	5.9%	118

The second research objective sought to determine the current level of computer-based technology integration by the secondary agricultural education teachers. The KRTIS technology integration continuum contains four distinct and independent phases that were used to answer this question: (1) exploration, (2) experimentation, (3) adoption, and (4) advanced integration. Table 7 presents the means, standard deviations, frequency, and percent of the participants’ most active area in the KRTIS phases of computer-based technology integration.

Table 7

Level of Computer-based Technology Integration of the Respondents (N = 118)

	<i>M</i>	<i>SD</i>	<i>Most Active</i>	<i>Percent</i>
Exploration (5 statements in subscale) grand mean	3.1	.78	23	19.5%
Experimentation (9 statements in subscale) grand mean	2.0	.53	9	7.6%
Adoption (16 statements in subscale) grand mean	3.6	.67	81	68.6%
Advanced Integration (4 statements in subscale) grand mean	2.3	.68	5	4.2%

Note. Scale: 1 = Not Like Me at All, 2 = Very Little Like Me, 3 = Somewhat Like Me, 4 = Very Much Like Me, and 5 = Just Like Me.

Over two-thirds (68.6%) of the participants were most active in the phase of adoption – using computer-based technology regularly, 19.5% of the teachers identified with the phase of exploration – thinking about using computer-based technology. The phase of experimentation – beginning to use computer-based technology accounted for 7.6%, and 4.2% of the teachers identified with advanced integration – innovative use of computer-based technology as their phase of integration. A majority of the participants were in the later stages of integration with 72.8% identifying with the phases of adoption and advanced integration.

The focus of research objective three was to determine the level of correlation between the secondary agriculture teacher’s level of computer-based technology integration and the selected demographic variables of: (a) age, (b) gender, (c) education level, (d) years of teaching, (e) school size, (f) high speed Internet at home, and (g) computer at home. The results indicated that there was no relationship between the selected demographic variables and the teachers’ level of computer-based technology integration. Table 8 presents the Pearson product-moment correlation coefficient.

Table 8

Summary of Correlations Between Selected Demographic Variables and the Level of Computer-Based Technology Integration of the Participants

	Pearson Correlation Coefficient	Assumption Significance
Age	.148	.109
Gender	-.044	.636
Education level	-.060	.517
Years of teaching	.044	.637
School size	.104	.264
High speed Internet at home	.013	.889
Computer at home	-.006	.946

Note. Age: 1 = <35, 2 = >35. Gender 1 = Male, 2 = Female. Education: 1 = Bachelors Degree, 2 = Masters or more. Years of teaching: 1 = <10 years, 2 = >10 years. School size: 1 = <250 students, 2 = >250 students. High-speed Internet at home: 1 = Yes, 2 = No. Computer at home: 1 = Yes, 2 = No.

Pearson correlations produced negligible to low correlation with the variables examined. Age ($r = .148$) and size of school’s student population ($r = .104$) provided the only, yet small, correlation. Older teachers (35 years of age and older), had a higher level of integration, and the teachers in larger schools (more than 250 students enrolled) had a higher level of integration. According to Cohen (1988), these results indicate a small correlation. Overall, the secondary agricultural education teacher’s gender, education level, years of teaching experience, availability of high-speed Internet at home, and availability of a computer at home provided very little correlation.

Conclusions/Recommendations/Implications

Objective one examined the demographic profile of the Oregon agricultural education teachers. The teachers reported a mean age of 33 years. This is seven years less than the age of participants in Alston's (2003) examination of secondary agricultural education teachers in North Carolina and Virginia where the mean age was 40 years. The mean age of the participants in this study was also less than the mean age of the participants in a northwest regional study by Nordheim and Connors (1997) in which the average age of agriculture teachers was 40. The population of secondary agricultural education teachers in Oregon appears to be younger than the average of other regional studies.

The male to female ratio of 2:1 is in line with Alston's (2003) study in North Carolina and Virginia which reported that 64.6% of the teachers were male and 35.4% were female. These numbers are in stark contrast to those reported in the Kotrlik et al. (2000) study of Louisiana agricultural education teachers, where 94% of the teachers were male. The results from this study are also in contrast to a national study (Warnick, 2004) of beginning secondary agricultural education teachers where the national sample contained 51.9% males. With agricultural education being a traditionally male-dominated profession (Foster, 2001), the results indicate there are strides towards gender balance in some states.

Objective two examined the level of computer-based technology integration by the Oregon secondary agricultural education teachers. The findings of this study are slightly different from other related instructional technology studies in agricultural education. The Kotrlik et al. (2003) study indicated that secondary agricultural education teachers in Louisiana were most active in the area of exploration – thinking about using technology, and least active in the area of advanced integration – innovative use of computer-based technology. However, the grouping between the top pair, adoption and exploration, and the bottom pair, experimentation and advanced integration, were consistent between the two states. The research suggests that the Oregon teachers perceive they are adopting technology into their instructional practices and are at a higher level of integration than the Louisiana agricultural education teachers.

A two-thirds majority (68.6%) of the participants in this study were in the phase of adoption, using computer-based technology regularly, and least active in the area of experimentation, beginning to use computer-based technology.

Based upon the results of objective two, it is recommended the a study be conducted to study the advanced integrators, those who were categorized in the advanced integration phase of the KRTIS, and the individuals who were categorized in the low level of integration, the exploration phase, or thinking about using technology. The study could determine what factors assisted the advanced integrators in developing their computer-based technology skills. This evaluation would provide a more in-depth analysis of the teachers' level of computer-based technology integration and a possible examination of the effectiveness of the KRTIS to measure the level of integration by the Oregon secondary agricultural education teachers.

The proposed research should use the benchmark established by the current study of Oregon secondary agricultural education teachers' level of computer-based technology integration. This benchmark will provide a point to measure progression over time to determine

if the Oregon population is progressing in their level of computer-based technology integration or if there is an ebb and flow regarding the level of computer-based technology integration in relation to the various computer-based technological advancements (e.g., the introduction of a new computer operating system).

Objective three examined the level of correlation between the secondary agriculture teacher's level of computer-based technology integration and the selected demographic variables. The results indicated that there was no significance in relationship between computer-based technology integration and selected demographic variables of: (a) age, (b) gender, (c) education level, (d) years of teaching, (e) school size, (f) high speed Internet at home, and (g) computer at home. The examination of secondary agricultural education teachers in Texas (Fraze et al., 2002) yielded a moderate positive correlation with the stage of adoption and availability of a computer at home. This is in contradiction to the data collected from the Oregon agricultural education teachers. The results from this study are similar to those reported by Kotrlik et al. (2003) based on secondary agricultural education teachers in Louisiana. The variables of (a) age, (b) years of teaching, (c) home computer access, and (d) home Internet access failed to produce a significant level of variance in the level of technology integration by the teachers in Louisiana.

The results indicated that there was no significance in relationship between the sum of the computer-based integration scale and the selected demographic variables. A small correlation was shown between older teachers (35 years and older), as well as teachers at larger schools with a minimum enrollment of 250 students, and a higher level of computer-based integration.

Based upon the results of objective three, conduct a study examining the variables of teacher age and size of student population to determine what caused the level of correlation associated with those variables and the level of computer-based technology integration.

The results of this study indicate that there is a small level of correlation between teacher age, size of the student population, and the level of computer-based technology integration. Further research could support or reject this correlation and provide additional insight if the correlation was supported.

Are the older teachers (35 years of age and older) at a higher level of integration than the younger teachers, or do the older teachers have a different perspective regarding what computer-based technology integration entails? Since they are farther removed from their preservice training, do they perceive that using a computer for email communication purposes means they have "adopted" technology? Since the younger teachers are fresh from their preservice experience, they may be more familiar with the wide variety of available computer-based technology. Therefore, they recognize they do not know all aspects of what computer-based technology has to offer for their instructional practices. Consequently, they may perceive they are not fully integrating computer-based technology integration in all aspect of their programs. In reality, are the younger teachers integrating technology on a wider basis than the older teachers? Do the older teachers not know what they do not know?

The low correlation between size of school and the teacher's level of computer-based technology integration should be examined more closely. The larger schools (more than 250

students enrolled) correlated with a higher level of computer-based technology integration. Is the level of computer-based technology different between the small and large schools? Do larger schools have more resources available for computer-based technology, and therefore the agricultural education teachers have an increased level of integration?

The proposed research should use the benchmarks established by the current study of Oregon secondary agricultural education teachers' level of computer-based technology integration. This benchmark will provide a point to measure progression over time to determine if the variables concerning teachers' age and size of student population have an impact on the level of computer-based technology integration.

The Oregon Vocational Agricultural Teachers Association (OVATA) in conjunction with the Oregon Department of Education (ODE) and Oregon State University (OSU) should examine methods to encourage computer-based technology integration. The cooperative effort between these entities could assist Oregon's agricultural education programs in reaching the curriculum goals in technology and would bring the state into compliance with state and national standards as outlined by the NCLB (2002) and ODE (2002).

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