Accessibility and Usage of Technology by North Carolina Agriculture Teachers

Maegen R. Williams[1], Wendy J. Warner[2], James L. Flowers[3], and D. Barry Croom[4]

Abstract

This study examined the integration of technology into the instructional process in North Carolina agricultural education classrooms. The study used survey research methodology to collect information on the availability of instructional technology and the frequency of instructional technology use by North Carolina agriculture teachers. The study found most teachers had access to digital projectors and digital cameras. Agriculture teachers also had convenient access to a teacher desktop computer and teacher laptop computer. The most commonly used software included Internet browsers and software for managing student records. Use of technology by agriculture students was less frequent and commonly consisted of Internet searching and use of reference materials on CD-ROMs. It is recommended the findings of this research study be used to inform future professional development offerings. Also, there should be additional investigation of appropriate learner-centered approaches to technology integration and continued research on the availability and utilization of educational technology in agriculture classrooms over time.

Keywords: technology integration; instructional technology; agricultural education

In 2009, the National Education Technology Plan, *Transforming American Education: Learning Powered by Technology*, was presented to Congress. The plan calls for "applying the advanced technologies used in our daily personal and professional lives to our entire education system to improve student learning, accelerate and scale up the adoption of effective practices, and use data and information for continuous improvement" (U.S. Department of Education, Office of Educational Technology, 2010, p. vi). Specific technological goals have been identified in five areas deemed as critical components of the educational system: learning, assessment, teaching, infrastructure, and productivity. To achieve these goals, educators must "leverage technology to provide engaging and powerful learning experiences, to deliver content, and to develop resources and assessments that measure student achievement in more complete, authentic, and meaningful ways" (U.S. Department of Education, Office of Educational Technology, 2010, p. v).

The use of technology continues to increase at a significant rate in our society (Mueller, Wood, Willoughby, Ross, & Specht, 2008). The inclusion of educational technology can improve student mastery of content, provide individualized instruction, improve students' attitudes towards learning, prepare students for the workforce, and increase the cost effectiveness of instruction (Boe, 1989). Alston, Miller, and Williams (2003) stated students should "use technology in learning to solve problems, improve productivity, and gain the skills necessary to become contributing members of their communities and lifelong learners" (p. 39). Marcoux and Loertscher (2009)

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[1] Maegen R. Williams is an AgriConsumer Loan Officer at Carolina Farm Credit, 251 Rock Crusher Road, Asheboro, NC 27203, mwilliams@cfarmc.com.

[2] Wendy J. Warner is an Assistant Professor in the Department of Agricultural and Extension Education at North Carolina State University, Campus Box 7607, Raleigh, NC, 27695, wjwarner@ncsu.edu.

[3] James L. Flowers is a Professor and Department Head in the Department of Agricultural and Extension Education at North Carolina State University, Campus Box 7607, Raleigh, NC, 27695, flowersj@ncsu.edu.

[4] D. Barry Croom is a Professor in the Department of Agricultural and Extension Education at North Carolina State University, Campus Box 7607, Raleigh, NC, 27695, dbcroom@ncsu.edu.

recognized several ways to achieve teaching and learning excellence with technology including efficiency, motivation to learn, deep understanding, learning how to learn (21st century skills), creativity and content creation, and inclusion of different types of learners.

Due to the many benefits of using technology in education, a great deal of emphasis on incorporating technology in instruction is being exhibited at the national level. The National Educational Technology Standards for Teachers (NETS·T) increase expectations for educators to develop and demonstrate digital skills in the classroom. Initially developed in 2000, these standards recognize the critical contributions of teachers to a dynamic learning environment enhanced through technology. Teachers are challenged to transform their classrooms to "ensure digital-age students are empowered to learn, live, and work successfully, today and tomorrow!" (International Society for Technology in Education, 2008, p. 4).

In order for teachers to effectively integrate and utilize technology, they must first have access to the necessary hardware and software. In 2010, the U.S. Department of Education, National Center for Education Statistics (NCES) provided the data on the availability and use of educational technology in public schools. In fall 2008, this study found an estimated 100% of public schools had one or more instructional computers with Internet access and a 3.1 to 1 ratio of students to instructional computers with Internet access. Ninety seven percent of schools had one or more instructional computers located in classrooms. Over half of schools reported having laptop computers on carts. Due to the inability to provide one to one computer access in all schools, these laptops were shared among classrooms to provide access for student instruction. In public schools, 14% of all instructional computers were laptops on carts and 51% were located in classrooms. Of these instructional computers, 98% had Internet access. Whole school wireless network access was reported by 39% of schools, while 30% reported wireless access to a portion of the school. Public schools also reported providing liquid crystal display (LCD) projectors and digital light processing (DLP) projectors in 97% of schools. Digital cameras were available in 93% of schools and interactive whiteboards in 73% of schools (U.S. Department of Education, NCES, 2010).

In addition to instructional activities, public schools used the Internet and their district network for other school related functions. Eighty seven percent of schools reported using their network to provide standardized assessment results and data for teachers to individualize instruction and 85% reported use for collecting data for instructional planning. Online student assessment was used by 72% of schools and 65% used their online capabilities to provide high quality digital content (U.S. Department of Education, NCES, 2010).

In agricultural education, a study of Louisiana agriscience teachers concluded the most accessible form of technology was teacher email accounts (Kotrlik, Redmann, & Douglas, 2003). A more recent study found all Louisiana agriscience teachers had a school email account. Additionally, teachers reported using interactive DVDs or CDs, digital cameras, and video players (Kotrlik & Redmann, 2009). However, this study also concluded, "many programs still do not have access to some of the newer technologies and teachers continue to experience moderate barriers" (Kotrlik & Redmann, 2009, p. 72).

Rogers (2003) described the process of innovation adoption as a longitudinal process consisting of a series and actions and decisions. In the Model of the Innovation-Decision Process, Rogers identified five stages: knowledge, persuasion, decision, implementation, and confirmation. In the fourth phase, implementation, an individual puts an innovation into use (Rogers, 2003). In order for implementation to take place, there must be access to the innovation. Consequently, this study sought to examine the accessibility and implementation of educational technology in North Carolina agricultural education classrooms.

There is a need for this study because there is limited data on the availability of technology and frequency of technology integration, specifically in agricultural education. Previous data from agricultural education studies do not represent some of the most current hardware such as interactive whiteboards, classroom response systems, or iPads or recent software appropriate for classroom instruction. The integration of instructional technology in agricultural education is an

important contributor to engaged learning environments, which reflects Priority Four in the National Research Agenda for Agricultural Education (Doerfert, 2011).

Purpose and Objectives

The purpose of this study was to examine the integration of technology into the instructional process in North Carolina agricultural education classrooms. The research objectives for this study were to:

1. Determine the availability of educational technology in agricultural education class-rooms.
2. Determine how frequently educational technology is utilized in agricultural education classrooms.

Methods and Procedures

The study used survey research methodology to collect information on the availability of instructional technology and the frequency of instructional technology use by North Carolina agriculture teachers. The population for this study consisted of all middle and high school agricultural education teachers in North Carolina ($N = 420$). The frame used to determine the population was a list of 2012-2013 agriculture teachers provided by the North Carolina Agricultural Education Regional Coordinators.

The survey instrument was developed to meet the objectives of the study. Questions for the instrument were adapted from the *Educational Technology in U.S. Public Schools: Fall 2008* and *Teachers' Use of Educational Technology in U.S. Public Schools: 2009* questionnaires published by the National Center for Education Statistics in the U.S. Department of Education (2010) and an instrument developed by Coley (2012). The instrument was reviewed for content validity by faculty members in the Agricultural and Extension Education Department at North Carolina State University.

A pilot study was conducted using 22 Career and Technical Education teachers in North Carolina. Reliability was determined using the test-re-test approach (Ary, Cheser Jacobs, Razavieh, & Sorenson, 2006). The instrument was evaluated for significant differences between the first and second responses of the 22 participants. No significant differences were found. Therefore, the instrument was determined to be stable over time.

The survey implementation followed the procedure recommended by Dillman, Smyth, and Christian (2009). A pre-notice letter was sent to subjects prior to the receipt of the instrument. Qualtrics, an online survey program, was used to send an email message to all agriculture teachers describing the research process, informed consent, and containing a link to the instrument. One week later, each agriculture teacher received another email message containing a link to the informed consent and survey instrument. Two additional reminder email messages were sent out over the course of 12 days. Qualtrics ensured only individuals who had not completed the survey were sent reminder email messages. A thank you email message was sent to all participants 5 days after the deadline. Three hundred and four North Carolina agriculture teachers completed the survey instrument for a response rate of 72.4%.

The questions were formatted based on a Likert scale, multiple-choice format, or a listing of responses. Section one of the instrument was an introduction to the survey. In section two, teachers were asked to identify the availability of teacher-based technology and the frequency of use for the available technology. This section listed various types of technology including devices, software programs, and Web services. The availability of devices question included *not available*, *available as needed*, and *always in classroom*. The frequency of device use utilized a 5-point Likert scale ranging from 1 (*never*) to 5 (*daily*) with a 3 meaning *2-4 times a month*. The software

programs and Web services questions used a 6-point Likert scale ranging from 1 (*not available*) to 6 (*daily*) with a 4 meaning *2-4 times a month*.

The next section of the survey asked agriculture teachers to identify the availability and frequency of use of instructional technologies by their students. The first question was an open-ended question that asked teachers to provide the number of student computers and tablet computers located in the classroom every day and that could be brought into the classroom. Similar to section one, this section listed various types of technology and utilized a 6-point Likert scale ranging from 1 (*not available*) to 6 (*daily*) with a 4 meaning *2-4 times a month*. The final section of the instrument included demographic questions such as   age, gender, years of teaching experience, number of agriculture teachers at the school, and teaching region.

In order to improve the response rate, the survey was kept short and the completion time was estimated to be less than 15 minutes. Potential participants received a $1 bill with the pre-notice letter and were entered into a drawing for two $50 gift cards as an incentive (Dillman, Smyth, & Christian, 2009). To address non-response errors, the researcher compared early to late respondents, and no significant differences were found (Miller & Smith, 1983).

Results and Findings

The North Carolina agriculture teachers participating in this study were comprised of 57% male teachers (*n* = 173) and 43% female teachers (*n* = 131). The average agriculture teacher was approximately 37 years old and had been teaching for 11 years. Teachers were representative of all eight regions in North Carolina. There were 50 from the Southeast Region (16%), 49 teachers from the East Central Region (16%), 45 from the South Central Region (15%), 41 from the West Central Region (13%), 40 from the Southwest Region (13%), 33 from the Northwest Region (11%), 27 from the West Region (9%), and 19 from the Northeast Region (6%). There was considerable variation in the number of agriculture teachers per program. One hundred twenty-seven of the teachers taught in a one-teacher program (42%), 121 taught in a two-teacher program (40%), 41 taught in a three-teacher program (13%), 9 taught in a four-teacher program (3%), and 6 taught in a program with five or more teachers (2%).

The first objective of this study was to determine the availability of educational technology in North Carolina agricultural education classrooms including computer operating systems, teacher-based devices, student computers, and tablet computers. Over half (51.64%) of the teachers reported Microsoft Windows XP was the computer operating system they used most often at school. Eighty of the teachers used Microsoft Windows 7 (26.32%), 22 teachers weren't sure but thought it was Windows (7.24%), 21 teachers used Apple/Mac OS X (6.91%), 17 teachers used Microsoft Windows Vista (5.59%), 1 teacher used Linux (0.33%), and 1 teacher wasn't sure but thought it was Mac (0.33%). Other operating systems teachers reported included Microsoft 2007, Microsoft Windows 3, and using multiple operating systems such as Windows 7 and XP. Table 1 displays the operating systems teachers used at school.

Table 1

Computer Operating System

Operating System	N	%
Microsoft Windows XP	157	51.64
Microsoft Windows 7	80	26.32
Not sure, but I think it's Windows	22	7.24
Apple/Mac OS X	21	6.91
Microsoft Windows Vista	17	5.59
Other	5	1.64
Linux	1	0.33
Not sure, but I think it's Mac	1	0.33

The most available technological device to agriculture teachers in their classrooms was projectors. Other devices teachers had in their classrooms included teacher desktop computers, DVD players, teacher laptop computers, older technologies (e.g., VHS, overhead projector), digital cameras, interactive whiteboards (e.g., SMART Board, Activboard), and video camera/camcorders. Most teachers did not have access to video conference units (61.51%), iPads or tablet computers (59.54%), and MP3 players or iPods (55.92%). Teachers also reported having access to a 3-D projector, ELMO, Mobi, a printer/copier/fax, web cam, and wireless Internet. Table 2 shows the availability of various teacher-based devices for instructional purposes.

Frequency of Instructional Technology Use

The second objective was to determine how frequently instructional technology (i.e., computers, devices that can be attached to computers, computer software, and web based applications) were utilized in North Carolina agricultural education classrooms by teachers and students. The most frequently used technological device for instruction was the projector. Other technologies commonly used included teacher desktop computers and teacher laptop computers. Technologies used only a several times a year included DVD players, interactive whiteboards (e.g., SMART Board, Activboard), digital cameras, and older technologies (e.g., VHS, overhead projector). Document cameras, video camera/camcorders, iPad or tablet computers, classroom response systems (e.g., clickers), MP3 players/iPods, and video conference units were rarely used by teachers. Teachers also reported Elmo, Mobi, and power point via TV were devices they used for instruction. Table 3 shows the frequency of use of various devices for instructional purposes.

The most frequently used software program for planning and instruction was an Internet browser (e.g., Internet Explorer, Mozilla Firefox, Apple Safari, Google Chrome). Other software programs commonly used included software for managing student records (attendance, grades, reporting), word processing software (e.g., Word, Pages), software for making presentations (e.g., PowerPoint, Keynote), spreadsheets and graphing programs (e.g., Excel, Numbers), and state-specific software for administering tests (e.g., Elements). Software programs used only several times a year included video or audio player software (e.g., Windows Media Player, iTunes), publication software (e.g., Publisher), and database management software (e.g., Access). Photo creation and editing software (e.g., Photoshop, Picasa), drill/practice programs/tutorials software, subject-specific programs (e.g., iCEV, My CAERT), simulation and visualization programs, video creation and editing software (e.g., Windows Movie Maker, iMovie), and website composer software (e.g., Dreamweaver, Seamonkey) were rarely used by teachers. Word processing software

was the only software accessible to all teachers. Only one teacher did not have access to spreadsheets and graphing programs and software for making presentations. Other software programs used for planning and instruction included Agriculture Experience Tracker (AET), power points from Internet, and Pix writer, and Notebook. Table 4 shows the frequency of use of various software programs for planning and instructional purposes. The most frequently used web services for planning and instruction were for curriculum planning (e.g., Moodle for blueprints and instructional outlines). Another web service commonly used included data sharing services (e.g., Google Documents, Dropbox). Web services used only several times a year included a learning management system (e.g., Blackboard, Moodle), video sharing (e.g., YouTube, School Tube), personal website, blog, or wiki, chapter website, blog, or wiki, and social networking websites (e.g., Facebook, Twitter, Google Plus, FFA Nation). Online presentation websites (e.g., Prezi, Animoto, Glogster), social bookmarking (e.g., Diigo, Delicious, Pinterest), and photo sharing (e.g., Flickr, Picasa) were rarely used by most teachers that had these technologies available. Other web services used by teachers for planning and instruction included Edmodo, Gaggle, AET, and games. Table 5 shows the frequency of use of various web services for planning and instructional purposes.

Computers were more available and used more frequently than tablet computers by students. Students used computers more frequently in the classroom rather than in other settings during instructional time. Computers at another location in the school were used a few times a month. Almost half of the teachers did not have tablet computers available in their classroom (48.36%) or in another location in the school (45.72%). Table 6 displays the frequency of computer and tablet computer use during instructional time by students.

The most frequently performed activity using educational technology by students in the agriculture classroom was conducting research (e.g., Internet searching, using reference materials on CD-ROM). Other activities commonly performed were preparing written text (e.g., word processing, desktop publishing), corresponding with others (e.g., students, teachers, experts) via email, network, or Internet, developing and presenting multimedia presentations (e.g., PowerPoint), creating or using graphics or visual displays (e.g., graphs, diagrams, pictures, maps), solving problems, analyzing data, or performing calculations, and conducting experiments or performing measurements. Using social networking websites, creating art, music, movies, or webcasts, and contributing to blogs or wikis were rarely used by most teachers. Teachers also reported students play games, use Google Docs, use online simulations, and take state-specific standardized tests during their classes. Table 7 lists activities performed by students using education technology.

Table 2

Availability of Teacher-based Devices

Technology Type	Not Available		Available as Needed		Always in Classroom	
	N	%	N	%	N	%
Projector	6	1.97	25	8.22	273	89.80
Teacher desktop computer	31	10.20	23	7.57	250	82.24
Teacher laptop computer	31	10.20	50	16.45	223	73.36
DVD player	18	5.92	70	23.03	216	71.05
Older technologies (e.g., VHS, Overhead Projector)	23	7.57	91	29.93	190	62.50
Interactive whiteboard (e.g., SMART Board, Activboard)	116	38.16	49	16.12	139	45.72
Digital camera	35	11.51	155	50.99	114	37.50
Document camera	112	36.84	99	32.57	93	30.59
Video camera/camcorder	60	19.74	185	60.86	59	19.41
Classroom response system (e.g., clickers)	124	40.79	129	42.43	51	16.78
iPad or tablet computer	181	59.54	81	26.64	42	13.82
Video conference unit	187	61.51	93	30.59	24	7.89
Other	262	86.18	18	5.92	24	7.89
MP3 player/iPod	170	55.92	113	37.17	21	6.91

Table 3

Use of Devices for Instruction

Technology Type	Never		Several times a year		2-4 times a month		2-3 times a week		Daily	
	N	%	N	%	N	%	N	%	N	%
Projector	47	15.46	5	1.64	7	2.30	17	5.59	228	75.00
Teacher laptop computer	17	5.59	12	3.95	8	2.63	58	19.08	209	68.75
Teacher desktop computer	44	14.47	19	6.25	15	4.93	27	8.88	199	65.46
Interactive whiteboard	138	45.39	24	7.89	16	5.26	34	11.18	92	30.26
iPad or tablet computer	228	75.00	28	9.21	14	4.61	18	5.92	16	5.26
Classroom response system	174	57.24	47	15.46	40	13.16	29	9.54	14	4.61
Other	74	24.34	98	32.24	103	33.88	18	5.92	11	3.62
MP3 player/iPod	34	11.18	63	20.72	147	48.36	50	16.45	10	3.29
Video conference unit	273	89.80	10	3.29	7	2.30	6	1.97	8	2.63
Digital camera	200	65.79	61	20.07	27	8.88	10	3.29	6	1.97
Older technologies	73	24.01	87	28.62	94	30.92	44	14.47	6	1.97
Document camera	143	47.04	115	37.83	35	11.51	7	2.30	4	1.32
Video camera / camcorder	239	78.62	44	14.47	14	4.61	5	1.64	2	0.66
DVD player	260	85.53	32	10.53	9	2.96	2	0.66	1	0.33

Table 4

Use of Software Programs for Planning and Instruction

Technology Type	Not available		Never		Several times a year		2-4 times a month		2-3 times a week		Daily	
	N	%	N	%	N	%	N	%	N	%	N	%
Internet browser (e.g., Internet Explorer, Mozilla Firefox, Apple Safari, Google Chrome)	4	1.32	3	0.99	2	0.66	10	3.29	32	10.53	253	83.22
Software for managing student records (attendance, grades, reporting)	4	1.32	16	5.26	10	3.29	11	3.62	26	8.55	237	77.96
Word processing software (e.g., Word, Pages)	0	0.00	3	0.99	10	3.29	20	6.58	91	29.93	180	59.21
Software for making presentations (e.g., PowerPoint, Keynote)	1	0.33	5	1.64	21	6.91	41	13.49	96	31.58	140	46.05
Spreadsheets and graphing programs (e.g., Excel, Numbers)	1	0.33	12	3.95	54	17.76	83	27.30	90	29.61	64	21.05
Software for administering tests (e.g., Elements)	6	1.97	21	6.91	30	9.87	98	32.24	104	34.21	45	14.80
Database management software (e.g., Access)	32	10.53	114	37.50	54	17.76	48	15.79	37	12.17	19	6.25
Subject-specific programs (e.g., iCEV, My CAERT)	70	23.03	86	28.29	58	19.08	40	13.16	38	12.50	12	3.95
Video or Audio player (e.g., Windows Media Player, iTunes)	23	7.57	88	28.95	76	25.00	63	20.72	45	14.80	9	2.96
Drill/practice programs/tutorials	53	17.43	86	28.29	71	23.36	53	17.43	32	10.53	9	2.96
Publication software (e.g., Publisher)	25	8.22	58	19.08	116	38.16	68	22.37	30	9.87	7	2.30
Simulation and visualization programs	74	24.34	101	33.22	67	22.04	36	11.84	21	6.91	5	1.64
Other (please specify)	253	83.22	30	9.87	4	1.32	8	2.63	5	1.64	4	1.32
Photo creation and editing software (e.g., Photoshop, Picasa)	37	12.17	86	28.29	106	34.87	44	14.47	27	8.88	4	1.32
Website composer (e.g., Dreamweaver, Seamonkey)	67	22.04	159	52.30	49	16.12	17	5.59	9	2.96	3	0.99
Video creation and editing software (e.g., Windows Movie Maker, iMovie)	40	13.16	123	40.46	111	36.51	20	6.58	9	2.96	1	0.33

Table 5

Use of Web Services for Planning and Instruction

Technology Type	Not available		Never		Several times a year		2-4 times a month		2-3 times a week		Daily	
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Curriculum planning (e.g., Moodle for blueprints & instructional outlines)	4	1.32	15	4.93	54	17.76	95	31.25	93	30.59	43	14.14
Data sharing services (e.g., Google Documents, Dropbox)	12	3.95	75	24.67	48	15.79	65	21.38	67	22.04	37	12.17
Learning Management System (e.g., Blackboard, Moodle)	22	7.24	84	27.63	61	20.07	60	19.74	48	15.79	29	9.54
Social networking websites (e.g., Facebook, Twitter, Google Plus, FFA Nation)	31	10.20	125	41.12	43	14.14	41	13.49	41	13.49	23	7.57
Personal website, blog, or wiki	25	8.22	101	33.22	68	22.37	44	14.47	45	14.80	21	6.91
Chapter website, blog, or wiki	30	9.87	99	32.57	60	19.74	52	17.11	48	15.79	15	4.93
Video sharing (e.g., YouTube, School Tube)	24	7.89	90	29.61	55	18.09	66	21.71	55	18.09	14	4.61
Social bookmarking (e.g., Diigo, Delicious, Pinterest)	46	15.13	185	60.86	22	7.24	27	8.88	15	4.93	9	2.96
Photo sharing (e.g., Flickr, Picasa)	37	12.17	188	61.84	40	13.16	25	8.22	9	2.96	5	1.64
Online presentation websites (e.g., Prezi, Animoto, Glogster)	29	9.54	125	41.12	74	24.34	44	14.47	29	9.54	3	0.99
Other (please specify)	246	80.92	41	13.49	6	1.97	7	2.30	1	0.33	3	0.99

Table 6

Student Use of Computers and Tablet Computers

Technology Type	Not available N	%	Never N	%	Several times a year N	%	2-4 times a month N	%	2-3 times a week N	%	Daily N	%
Computers - In your classroom	37	12.17	26	8.55	62	20.39	63	20.72	66	21.71	50	16.45
Computers - Other location in your school	9	2.96	36	11.84	107	35.20	87	28.62	33	10.86	32	10.53
Tablet computers - In your classroom	147	48.36	91	29.93	27	8.88	15	4.93	13	4.28	11	3.62
Tablet computers - Other location in your school	139	45.72	101	33.22	32	10.53	15	4.93	9	2.96	8	2.63

Table 7

Student Use of Educational Technology

Activity	Not applicable N	%	Never N	%	Several times a year N	%	2-4 times a month N	%	2-3 times a week N	%	Daily N	%
Correspond with others (e.g., students, teachers, experts) via email, network, or Internet	20	6.58	72	25.35	72	25.35	68	23.94	40	14.08	32	11.27
Prepare written text (e.g., word processing)	7	2.30	33	11.11	111	37.37	84	28.28	51	17.17	18	6.06
Conduct research (e.g., Internet searching, using reference materials on CD-ROM)	5	1.64	12	4.01	114	38.13	91	30.43	65	21.74	17	5.69
Use social networking websites	34	11.18	174	64.44	39	14.44	31	11.48	12	4.44	14	5.19
Other (please specify)	242	79.61	44	70.97	7	11.29	4	6.45	4	6.45	3	4.84
Develop and present multimedia presentations	11	3.62	31	10.58	137	46.76	92	31.40	19	6.48	14	4.78
Solve problems and analyze data	16	5.26	67	23.26	106	36.81	67	23.26	36	12.50	12	4.17
Create or use graphics or visual displays	8	2.63	59	19.93	118	39.86	74	25.00	36	12.16	9	3.04
Contribute to blogs or wikis	37	12.17	199	74.53	33	12.36	17	6.37	13	4.87	5	1.87
Conduct experiments or perform measurements	18	5.92	80	27.97	103	36.01	69	24.13	29	10.14	5	1.75
Create art, music, movies, or webcasts	28	9.21	138	50.00	94	34.06	32	11.59	10	3.62	2	0.72

Conclusion, Recommendations, and Implications

Based on the results of this study, over half (51.64%) of the North Carolina agriculture teachers use Microsoft Windows XP, the most often at school. Released in 2001, Microsoft Windows XP is over 10 years old (Microsoft, 2001). Only 26.32% ($n = 88$) of the teachers used Microsoft Windows 7, the newest Windows operating system. Most agriculture teachers do not have access to the most up-to-date Windows operating system.

Almost all agriculture teachers (98.03%) had access to projectors. These results are consistent with the U.S. Department of Education's *Educational Technology in U.S. Public Schools: Fall 2008* (2010) which reported 97 % of schools had projectors. Most agriculture teachers also had access to digital cameras (88.49%) and interactive whiteboards (61.84%). These results are somewhat low compared to the U.S. Department of Education's findings that digital cameras were available in 93% of schools and interactive whiteboards in 73% of schools. Less than 12% of agriculture teachers did not have access to a teacher desktop or laptop computer, a DVD player, and older technologies such as VHS or an overhead projector. Over half of the agriculture teachers did not have access to new educational technologies such as video conference units, iPads or tablet computers, and MP3 players or iPods. Overall, agriculture teachers had reasonable access to a variety of teacher-based devices.

Over 65% of agriculture teachers used a projector, a teacher desktop computer, and a teacher laptop computer on a daily basis. These technologies were also the most available and always in the classroom. Agriculture teachers are using the technologies that are easy to access within their own classrooms. On the other hand, most agriculture teachers had DVD players (94.08%) and older technologies such as VHS or an overhead projector (92.43%) always in the classroom, but 85.53% and 24.0% of agriculture teachers, respectively, never use these technologies. North Carolina agriculture teachers are using newer technologies instead of older technologies.

Additionally, over 75% of agriculture teachers had access to all the software programs listed on the survey instrument and used an Internet browser and software for managing student records on a daily basis. The majority of agriculture teachers used publication software several times a year. However, this rate of frequency is appropriate for these different types of technology. Agriculture teachers also had limited access to simulation and visualization software programs and website composer software such as Dreamweaver or Seamonkey. Over 60% of the agriculture teachers that had access to social bookmarking and photo sharing never used them. A higher percentage of agriculture teachers reported never using these web services as compared to the percentage of agriculture teachers that did not have these technologies available. These web services are relatively new; therefore, agriculture teachers may be unaware of their existence or do not know how to use them.

Most agriculture teachers had access to computers either in their classroom or at another location in the school for student use. Students used these computers several times a year or 2-4 times a month. On the other hand, almost half of the agriculture teachers did not have access to tablet computers. Of the agriculture teachers that did have access to tablet computers, most of the students never used the tablet computers or only used them several times year. The most frequently performed activity using educational technology by agriculture students in the classroom was conducting research such as Internet searching or using reference materials on CD-ROM. Using social networking websites, creating art, music, movies, or webcasts, and contributing to blogs or wikis were rarely used student activities in the classroom.

Based on the survey results, when agriculture students used technology in the classroom, they were typically using basic technology skills, and when compared to teacher use of technology, the students' use is considerably less frequent. Other research suggested the lack of student technology use might be the result of the lack of pedagogical knowledge. Russell, Bebell, O'Dwyer, and O'Connor (2003) and Sangra and Gonzalez-Sanmamed (2010) found teachers tended to use

technology more for teacher-centered activities such as gaining attention, student response, and transmitting information compared to student-centered activities such as interaction and communication.

To increase student use of technology, agriculture teachers need to be better informed as to what contributes to effective technology use for learner-centered instruction. Agriculture teachers who have successfully integrated a learner-centered approach could share lesson plan examples, artifacts of student work, and best practices for technology inclusion. Also, observations should be conducted in agriculture classrooms that emphasize a student-centered approach to technology integration. These observations could be used in the development of practitioner appropriate research findings and recommendations that could be distributed at state and national agriculture teacher conferences.

The findings of this research study can make an important contribution to professional development offerings. The knowledge of technology hardware and software agriculture teachers have access to and utilize on a regular basis can inform the development of appropriate workshops and trainings. Most teachers reported having access to several technologies that were rarely used such as photo and video creation and editing software. Many of these programs are offered for free or at little expense via the Internet. The integration of such topics into professional development would help increase teacher awareness of the technology and ideas for classroom integration.

Future research should be used to replicate this study and examine agriculture
teachers' access to and use of educational technology in different states. Additional inquiry could further examine the integration of educational technology in agriculture classrooms through the use of classroom observations and teacher interviews. With the rapid change in technology, research must be conducted on a consistent basis. A longitudinal study could investigate how the availability and utilization of educational technology in agricultural education changes over time.

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