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Educators' Use of Technology in Arkansas Public Schools

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Abstract

This study investigated the use of technology in Arkansas Public Schools (APS) surveying educators on four issues: (1) availability and frequency of technology use in schools and homes; (2) types of technology used in schools and homes; (3) effects of technology on educators' teaching and administrative work; and (4) ways educators are prepared to use technology. Findings showed that the sharp "digital divide" based on unequal access to computers in schools across the state has decreased, but more work is needed for all teachers to access school technologies in rich and productive ways. APS educators expressed that using technology to create and deliver lessons helps them in teaching and completing administrative work, saves them time, and allows them to focus on teaching. They indicated that creating communities of learners to share ideas about technology have much greater influence on their practices than either professional development activities or technology coordinator consultation.

Introduction

Technology integration in classrooms has become an essential recommendation in recent educational reforms. For instance, the International Society of Technology in Education (ISTE) (International Society for Technology, 2007) has developed a set of technology guidelines and standards for teachers, students, and other stakeholders to improve the technology integration in teaching. These guidelines and standards have been widely adopted, adapted, or otherwise referenced in country/state and local educational institution's technology plans (Chen, 2010). Further, the U.S. government annually increases the dedicated funding for technology access in K-12 classrooms (Culp, Mcmillan, & Margaret, 2005). The U.S. government invested more than $40 billion dollars between 1990 and 2000 (Dickard, 2003). This increase in funding was reflected in the steady percentage increase of networked computers in public schools from 35% in 1994 to nearly 100% in 2005 (Wells & Lewis, 2006). However, recent surveys indicate the overall funding for K-12 dropped significantly in many states as state budget deficits rose. According to a report published by the American Association of School Administrators, 435 administrators from 45 states, 92% of whom were school district superintendents, responded to a school funding survey and indicated that technology purchases are increasingly being delayed due to lack of available funds. Approximately13% of purchases were delayed in 2008–2009; 29% and 57% of purchases were delayed in 2009–2010 and 2010–2011, respectively (Ellerson, 2010).

The need for technology integration in teaching and learning also was supported by a broad consensus among scholars and researchers who argued that the use of technology has a profound effect on teaching and learning. They concluded that diffusion of technology into teaching practices, under proper conditions, could deliver superior learning, engage students effectively in the learning process, enhance students' performance, improve the quality of education and better prepare students for the information age (Goodison, 2003; Hennessy, Ruthven, & Brindley, 2005; Kangro & Kangro, 2004; Kozma & Anderson, 2002; Pelgrum, 2001). Consequently, the research on the effectiveness of technology use in schools moved the technology integration debate beyond whether technology has anything to offer education toward establishing a base of scientific knowledge about the deployment and use of technology to improve students' learning.

Thus, teachers are required to incorporate technology into their curricula and expand their technology skills to meet national, state, and local educational institutions' technology plans and standards. Similarly, school administrators are facing pressing tasks emerging from the needs for the technology integration to update technology available in classrooms and to prepare teachers to use technology for instruction and administrative tasks. Additionally, there is constant pressure on teachers from their administration to stay up-to-date with technology for effective teaching. Under these conditions, teachers are working diligently to meet the national and state technology recommendations and to fulfill the administration's requirements while the fast-paced technological development has driven the required skills needed for today's teachers to pile up and demand them to master a wide range of applications and tools to meet future's work place.

Literature Review

Technology integration in the classroom has been a topic of research for the last few decades, and many studies focused on issues such as preparing educators to use technology efficiently, technology availability, lack of support, credibility of resources, effectiveness of teacher preparation to integrate technology, methods that best prepare teachers to integrate technology into their lessons, and barriers that impacted teachers' uses of technology (Lowther, Inan, Daniel, & Ross, 2008; Purcell, 2012). Ertmer (1999) examined the barriers that schools and teachers encounter during technology integration and identified two types of barriers: (1), external to the teacher and include resources (both hardware and software), preparation, and support; and (2) internal to the teacher and include teachers' confidence, beliefs about how students learned, as well as the perceived value of technology to the teaching/learning process.

Other studies examined the effect of the increased government funding dedicated to improve technology access in U.S. K-12 classrooms. For example, a study found that access to Internet connected computers has increased steadily during the last 20 years; 97% of teachers have access to one or more computers in the classroom and 96% of these available computers are Internet-connected (Gray, Thomas, Lewis, & Tice, 2010). According NEA survey (National Education Association, 2008), 74.1% of the educators reported that their access to computers, the Internet, and instructional software was adequate to do their jobs, and almost 94.6% of the educators reported having additional access to computers and the Internet at home. The survey also found that 81% of the educators reported having remote access to student data, and of these educators, 61% used this remote access sometimes or often.

Studies also found an increase in the use of Web 2.0 Internet applications during the last decade. These applications are web-based and do not require installation, allowing easy social connections and sharing resources between students and between students and teachers. For example, the Speak Up survey (2011) found that teachers increased the use of podcasts and Internet-based videos in classrooms over 50% since 2008; almost all teachers, 96%, reported using Internet-based communications tools to connect with peers or parents and 90% reported they are using the Internet to find information regularly. Other surveys also found improvement in teachers' professional development. For example, NEA survey results (2008) found that 68.3% or the majority of teachers reported that they have been adequately prepared to operate technology equipment, 71,1% used the Internet to search for information, and 68.3% use administrative software to take attendance or submit grades. Other studies examined different types of support to technology integration such as administrative, technological, professional,

and peer. For example, the Speak Up 2010 survey (2011) found that 70% of the responding school/district administrators regarded technology support as not a challenge.

Research

Questions

This study investigated ways that Arkansas Public School (APS) teachers use technology for teaching and administrative tasks primarily in comparison with National Public School (NPS) teachers and was guided by the following questions:

1. Is there a difference in the technology availability between APS and NPS?
2. Is there a difference in the frequency of use of technology between educators in APS and NPS?
3. How do teachers in Arkansas public schools use technology?
4. How does technology use effect educators' work in APS?
5. How are educators in APS prepared to use technology?

Hypotheses

Based on previous studies on technology integration in classrooms, the investigator hypothesizes that:

- There is no difference in the technology availability between APS and NPS.
- There is no difference in the frequency of use of technology between educators in APS and NPS.
- Educators use technology in all teaching and administrative tasks in APS.
- The uses of technology affect APS educators' work positively.
- Educators in APS are prepared adequately to use technology.

The first and second questions addressed the availability and the frequency of the use of technology between APS and NPS. These primary research questions were at the heart of the study, as the answers to these questions could help administrators and policy makers plan initiatives at the local level to integrate educational technology within APS. According to the theory of acceptance and use of technology, there are four major factors that influence the use of technology in a task: performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh, Morris, Davis, & Davis, 2003). Consequently, the answers to these questions could help administrators facilitate the appropriate conditions by allocating resources that directly impact the strategic direction to support schools, districts, and digital providers in selecting or creating appropriate digital resources for instruction.

The third and fourth questions addressed different teaching and administrative tasks that APS educators conduct by using technology. The answers to these questions could help to identify the tasks and frequency the APS educators use technology in their work. Generally, instructional tasks used by educators can fall under a few categories such as planning, developing, organizing instruction, recordkeeping, managing student conduct, presenting material, and assessing student learning. According to recent research, the increased availability of the new portable digital technologies has provided educators with affordable and portable digital devices for use as teaching and learning tools anywhere and anytime (Crippen & Brooks, 2000; Liu, 2007; Motiwalla, 2007). Although these technologies can be harnessed for positive educational outcomes, other research suggests that these technologies can impair performance and distract learners if used inappropriately (Fried, 2008; Kraushaar & Novak, 2010).

The fifth question in this study addressed the methods that APS educators are using to enhance the use of technology. The answer to this question could help schools' administrators and technology coordinators to identify the best approaches to improve educators' preparation to use technology. According to many studies, there are different methods that help educators use technology in instruction such as professional development, learning communities, and on-site mentoring. However, the effectiveness of these methods is not equal and often requires school administrators to choose the proper method suited to their teachers. For example, studies found that teachers who did not receive in-classroom support following workshop-style preparation were less likely to implement student-centered instructional practices with technology, and that mentored teachers integrate technology more frequently over time than teachers who do not learn with a mentor (Smith & Smith, 2004; Swan & Dixon, 2006).

Methods

Participants. This study was conducted in APS during the 2011-12 fall semester. The study surveyed 482 educators in three APS districts of whom 3% were considered small districts, 29% were considered medium-sized districts, and 68% were considered large school districts. Participants who completed the survey included 81% female and19% males and worked in various types of employment with 22% elementary school teachers, 8% middle level teachers, 19% secondary school teachers, 17% special education teachers, 5% counselors, and 7% principals and assistant principals. The rest of the participants were physical education teachers, coaches, band directors, and vocational teachers, English as Second Language (ESL) teachers, gifted/talented (G/T) teachers, Title I teachers, librarians, and office directors, supervisors, assistant or associate superintendents, and superintendents. Participants' teaching experience amounted to 1 to 35 years; the average number of years with experience in education amounted to 10 years.

Materials. All of the survey questions were presented online as part of the Question Pro website and became available to each participant when the participant clicked on the survey link individually. The survey consisted of the following items:

Demographic questions. This section collected information about the participants' makeup. The survey consisted of five questions about each participant's (1) gender, (2) years in working in education, (3) school district size, (4) area of specialization, and (5) age.

Availability of technology hardware. A one-question, three-level scale (not available, available as needed, available in class-room every day) was designed to collect information about the availability of the technology hardware, such as LCD or DLP projector, videoconference unit, interactive whiteboard (e.g., SMART Board, Active-board), classroom response system, digital camera (still or video), MP3 player/iPod, document camera, handheld device (e.g., Palm OS, Windows CE, Pocket PC, BlackBerry), and computers in the classroom. Participants marked one of the three choices, and the score ranged from 1 (Not available) to 3 (In class-room every day).

Frequency of use of technology hardware. This was a one-question, four-level scale (never, rarely, some-times, often) to collect information about the frequency of technology hardware use such as LCD or DLP projector, videoconference unit, interactive whiteboard (e.g., SMART Board, Active-board), classroom response system, digital camera (still or video), MP3 player/iPod, document camera, handheld device (e.g., Palm OS, Windows CE, Pocket PC,

BlackBerry) and computers in the classroom. Participants marked one of the four choices, and the score ranged from 1 (never) to 4 (often).

Frequency of use of school or district network for administrative tasks. This one-question, five-level scale (not available, never, rarely, some-times, often) collected information about the frequency of use of school or district network for administrative tasks, such as entering or viewing grades, entering or viewing attendance records, administering assessments, entering or viewing results of student assessments, entering or viewing Individual Education Plans (IEP) or parts of the IEP relevant to their interactions with the student and how often they used remote access (e.g., access from home) for school work. Participants marked one of the five choices, and the score ranged from 1 (not available) to 5 (often).

Frequency of use of technology software. This one-question, four-level scale (never, rarely, some-times, often) collected information about the frequency of software use, such as word processing software, database management software (e.g., access), spreadsheets and graphing programs (e.g., excel), software for managing student records, software for desktop publishing, graphics, image-editing software (e.g., Photoshop, Kidpix), software for making presentations (e.g., PowerPoint, keynote), software for administering tests, simulation and visualization programs, drill/practice programs/tutorials, subject-specific programs, the internet, blogs and/or wikis and social networking websites. Participants marked one of the four choices, and the score ranged from 1 (never) to 4 (often).

The effect of technology use on educators. This was a one-question, five-level scale (not applicable, not at all, minor extent, moderate extent, major extent) to collect information about the effect of technology use on educators work, such as the use of hardware and software in the classroom saves instruction time, the use of software for administrative work at school and at home, the technical support provided by school saving time. Participants marked one of the five choices, and the score ranged from 1 (not applicable) to 5 (major extent).

Preparation to use technology. This one-question, five-level scale (not applicable, not at all, minor extent, moderate extent, major extent) collected information about the ways that educators are prepared to use technology for teaching and administrative work, such as professional development, preparation provided by staff responsible for technology support and/or integration at school, independent learning, consulting with technology coordinator and asking other teachers (community of learners).

Procedures. First, an invitation was sent to superintendents in 15 school districts to participate in this study. Second, a link with the online survey was sent to educators who agreed to participate in this study. Respondents completed and submitted the survey online.

Results

Prior to the main analysis, data were screened for normality, out-of-range responses, and systematic patterns of missing values; this process found that the data were normally distributed and with no apparent patterns or clusters emerging.

First and second research questions.

- Is there a difference in the technology availability between APS and NPS?
- Is there a difference in the frequency of use of technology between educators in APS and NPS?

Analysis. To address these questions, the investigator compared data collected from a teacher-level survey in APS. For NPS data, the investigator used data collected by the National Center for Educational Statistics among teachers in public elementary and secondary schools

during the winter and spring of 2009 (Aud, Hannes, & National Center for Education, 2010). Both data sets asked participants to assess the use of technology at home and at school to support schoolwork. The following are areas covered in both surveys:

- Availability and frequency of technology used (LCD projector, videoconference unit, interactive whiteboard, classroom response system, digital camera (still or video), MP3 player/iPod, document camera, handheld device and computers).
- Availability and frequency of network remote access used (e.g., access from home) for teachers to use in various school or district computer applications or data for instruction and administrative activities for school work
- Availability and frequency of computers and other technology devices used during instructional time
- Availability and frequency of systems on the school or district network used by teachers for various activities

The following are the key findings on the comparison between technologies in APS compared to technologies in NPS.

Table 1
Percent of Teachers with Computers in the Classroom and Percent of these Computers with Internet Access in APS compared to NPS

Status	Arkansas Public Schools (APS)	National Public Schools (NPS)
In Classroom Everyday	75	97
Available as Needed	17	54
Internet Access	75	93

Table 2
Percent of Technology Available in the Classroom Every day in APS compared to NPS

	LCD or DLP Projector		Interactive Boards		Digital Cameras	
Status	APS	NPS	APS	NPS	APS	NPS
In Classroom Everyday	80	36	49	28	33	64
Available as Needed	14	48	18	23	55	14
Internet Access	77	72	45	57	12	49

Table 3
Percent of the Frequency Use of School or District Network for Teaching Tasks

The Network Task	APS	NPS
Entering or Viewing Students' Grades	83	94
Entering or Viewing Students' Attendance	72	93
Entering or Viewing Students' Assessments	62	90

Table 4
Percent of Schools with Remote Access Used for Schoolwork

	APS	NPS

Some of the Time	62	85

Table 5

Percent of Teachers Reporting the Frequency in Using Various Types of Software and Internet Sites for Classroom Preparation, Instruction, or Administrative tasks in APS and NPS

Software and Internet Sites	APS	NPS
Word Processing Software	97	96
Spreadsheets and Graphing Programs (e.g., Excel)	62	61
Software for Managing Student Records	78	80
Software for Making Presentation (e.g., PowerPoint, Keynote)	80	63
Internet	95	94

Third research question.

- How do educators in Arkansas public schools use technology?

Analysis. To address this question, the investigator asked participants to identify the use of technology at home and at school to support schoolwork.

Table 6

Percent of Frequency of the Use of a System on School or District Network by APS Teachers and Administrators

	Not Available	Never	Rarely	Sometimes	Participants	Mean
Grades	3.40	11.11	2.49	82.99	441	3.65
Attendance	8.43	13.21	5.29	72.44	439	3.42
Assessments	21.55	24.59	16.16	37.70	427	2.70
R. Assessments	9.20	14.48	14.25	62.07	435	3.29
IEP	24.77	21.76	14.81	38.66	432	2.67
Remote Access	11.29	10.38	16.03	62.30	443	3.29

Table 7

Percent of Frequency and Type of Software Used for Classroom Preparation, Instruction, or administrative tasks in APS

	Not Available	Never	Rarely	Sometimes	Often	Participants	Mean
Word Processing	0.00	2.06	1.83	9.61	86.50	437	4.81
Database Management	9.02	27.56	19.51	16.59	27.32	410	3.26
Spreadsheets	2.53	14.29	21.20	28.57	33.41	434	3.76

Table 8

Percent of Frequency and Type of Software Used for Classroom Preparation, Instruction, or administrative tasks in APS

	Not	Never	Rarely	Sometimes	Often	Participants	Mean

	Available						
Managing Records	3.48	10.21	8.12	18.33	59.86	431	4.21
Publishing	4.47	15.76	16.47	27.53	35.76	425	3.74
Image Editing	9.00	21.56	21.56	27.01	20.85	422	3.29

Table 9

Percent of Frequency and Type of Software Used for classroom Preparation, Instruction, or administrative tasks in APS

	Not Available	Never	Rarely	Sometimes	Often	Participants	Mean
PowerPoint	0.93	6.03	12.99	33.18	46.87	431	4.19
Test Makers	11.93	25.54	17.90	22.91	21.72	419	3.17
Simulations	15.66	28.43	21.69	20.00	14.22	415	2.89
Tutorials	10.05	24.77	19.86	25.47	19.86	428	3.20

Table 10

Percent of Frequency and Type of Software Used for Classroom Preparation, Instruction, or administrative tasks in APS

	Not Available	Never	Rarely	Sometimes	Often	Participants	Mean
Subject-Specific Programs	7.98	18.78	15.73	26.29	31.22	426	3.54
Internet	0.46	1.84	3.00	19.59	75.12	434	4.67
Blogs/Wikis	12.38	30.24	15.95	21.43	20.00	420	3.06
Social Networking Websites	27.90	41.37	12.06	10.87	7.80	423	2.29
Other Applications	18.01	18.28	15.05	27.96	33.41	372	3.15

Table 11

Percent of Overall Frequency of Software and Hardware Used at School and Home for Classroom Preparation, Instruction, or administrative tasks in APS

	Not Applicable	Not at All	Minor Extent	Moderate Extent	Major Extent	Participants	Mean
Software at School	8.13	2.15	6.70	27.99	55.02	418	4.20
Hardware at School	10.39	2.42	7.25	25.85	54.11	414	4.11
Software at Home	8.67	3.13	12.77	30.12	45.30	415	4.00

Fourth research question.

- How does the use of technology affect educators' work in APS?

Table 12

Percent of Overall Frequency of Software and Hardware Used at School and Home for Classroom Preparation, Instruction, or administrative tasks in APS

	Not Applicable	Not at All	Minor Extent	Moderate Extent	Major Extent	Participants	Mean
Technology Saves Time	3.98	1.41	5.85	27.17	61.59	427	4.41

Analysis.

Correlation coefficient was conducted to evaluate the relation and the direction of the use of technology in saving educators' time. The result of the analysis indicated that there is a positive relationship between the use of technology and saving teachers' time.

- First, the results showed that there is correlation between using hardware at school and saving teachers' time for instructions, $r = .646$, $p = \leq .01$. (The more teachers using technology hardware at school, the more they save time for their instruction. Using technology hardware at school can account for 64.6% of variation in saving teachers' time).
- Second, results showed that there is correlation between using software at school and saving teachers' time for instructions, $r = .712$, $p = \leq .01$. (The more teachers using technology software at school, the more they save time for their instruction. Using technology software at school can account for 71.2% of variation in saving teachers' time).
- Third, results showed that there is correlation between using software at home and saving teachers' time for instructions, $r = .639$, $p = \leq .01$. (The more teachers using technology software at home, the more they save time for their instruction. Using technology software at home can account for 63.9% of variation in saving teachers' time.)

Table 13

Correlation Coefficient for Relationship between Saving Time and the Use of Software and Hardware at School and Software at Home for Classroom, Preparation, Instruction, or Administrative Tasks in APS

		Hardware at School	Software at School	Software at Home
Technology Saves Time	Pearson Correlation	.646**	.712**	.639**
Technology Saves Time	Sig. (2-tailed)	.000	.000	.000
	Covariance	.799	.810	.749
	N	411	414	412

***Means with different subscripts differ significantly at $p<.01$. (**.) Correlation is significant at the 0.01 level (2-tailed).

Fifth research question.

- How are educators in APS prepared to use technology?

Table 14

Percent of Activities that Would Help Educators in APS Save Time Using Educational Technology

	Not Applicable	Not at All	Minor Extent	Moderate Extent	Major Extent	Participants	Mean
Professional Development	2.05	5.71	23.74	36.07	32.42	438	3.91
Training Workshops	2.55	5.09	18.98	36.34	37.04	432	4.00
Independent Learning	3.21	6.19	19.72	36.24	34.63	436	3.93
Consulting Experts	3.68	7.13	26.21	33.56	29.43	435	3.78
Communities of Learners	1.83	2.74	19.63	41.10	34.70	438	4.04

Conclusion

In order to capitalize on the benefits of technology, this study examined the state of technology in Arkansas public schools with the hope that the findings would help individuals who design and implement technology in planning and developing initiatives. One of the important findings of this study is that the gap that exists at state-level has been narrowed, but there is still work to be done to see that all teachers have opportunities to use school technology in rich and productive ways. Further, the study's findings showed that there is inconsistency in the distribution of technology equipment among large, medium and small school districts in Arkansas. However, this variation should not cause any concerns to technology coordinators, as the elementary schools use different types of equipment than the middle levels and high schools. The results showed that the larger the school size, the more LCD projectors or document cameras are available. This outcome was met by more interactive whiteboards in the smaller school districts. Thus, a suitable strategy to distribute technology equipment in schools is by consulting with teachers about technology they normally use the most often and to provide them with the most needed equipment for their classrooms.

The findings of this study also indicated that creating communities of practice at schools have greater influence on teachers' practices. According to the findings, teachers base their decisions to learn about technology primarily on communications among their colleagues and with less regard for professional development activities or consulting with their technology coordinator. This finding is supported by prior research, which indicated that communities of practice may be a cost-effective alternative to professional development that can improve teachers' use technology for instruction (Glazer, Hannafin, & Song, 2005; Hughs & Ooms, 2004). Teachers in the communities of practice share solutions to the problems they face and receive support while integrating technology in the context of their classroom, without heavy reliance on an outside expert (Brill & Walker, 2006; Glazer, Hannafin, Polly, & Rich, 2009). Accordingly, administrators may allocate resources directed toward creating a central database or a teacher-based social network for the current issues facing teachers in the classrooms.

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