IJET

Kalonde, G. (2017). Rural school math and science teachers' technology integration familiarization. *International Journal of Educational Technology, 4*(1), 17-25.

Original Paper

Journal homepage: http://educationaltechnology.net/ijet/

OPEN ACCESS

Rural school math and science teachers' technology integration familiarization

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KEYWORDS

Professional development
Technology integration
Experiential learning
Educational hardware
Educational software

ABSTRACT

This study explored the significance of technology integration familiarization and the subsequent PD provided to rural middle school teachers with several opportunities to gain technological skills for technology use in rural middle school math and science classrooms. In order to explore the use of technology in rural schools, this study surveyed 63 rural middle school math and science teachers on technology use and PD offered for classroom integration. This study provided perceptions on the effect of personal and previous technology training for rural school teachers towards technology. The results show that there was need for PD to familiarize rural teachers with newer and essential instructional technologies and to gain technological skills experience in instructional technology integration. The results also show that teachers want to use technology to educate their students, but the lack of technology in the classrooms and the teachers' lack of familiarity and knowledge on some present technologies affects the usage which creates unforeseen future challenges in classrooms.

Introduction

Research has shown that instructional technology is an essential tool for effective instruction in math and science (McFarlane & Sakellariou, 2002; Riley, 2007), mathematics (Riley, 2007; Franz & Hopper, 2007) and other classrooms. Likewise, professional associations such as National Council of Teachers of Mathematics [NCTM] (International Society for Technology in Education, 2005) and National Association for Science Teachers [NSTA] (2005) view technology as a tool for effective instruction in math and science classrooms. As such, technology educators put emphasis on the use of instructional technology in all classrooms.

The integration of instructional technologies affects how teaching and learning are conducted in modern day classroom. Technology has changed the ways in which students learn new concepts and complete projects, and how teachers assess students' performance. The use of computer related technologies provide opportunities for the construction of new knowledge from different sources, the organization of qualified information, making meaning of information and presenting that information to students (Harris, 2013; Partnership for 21st Century Skills, 2003). Furthermore, technology assists students to expand beyond the limits of teacher instruction in class and beyond textbook-based learning. There is evidence that students who use technology in their classrooms are better to understand science concepts and application of mathematics skills (Dixon & Brown, 2012; Franz & Hopper, 2007).

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Nevertheless, accessibility and knowledge base for integration of technology in classrooms by teachers and students still remains a challenge in some schools. For example, studies have continued to show that some schools lack instructional technology integration knowledge and implementation knowledge, and this is not a new phenomenon as evidenced by statements in 2002 and eight years later in 2010 (Conley, 2010; Thomas & Bainbridge, 2002). Furthermore, studies have revealed that implementation of technology into rural schools is complex and requires teacher training as teachers encounter new and unfamiliar technologies as end users (Schrum, Burbank & Engle, 2005; Sze, 2004; Ritzhaupt, Dawson, & Cavanaugh, 2012).

Therefore, instructional technology's basic challenge is not its availability alone, but also how it is implemented and used by classroom teachers, especially those in rural schools, as in some cases, they encounter different challenges as compared to sub-urban and urban schools. Similarly, teacher attitudes, compounded by familiarity, knowledge and availability, toward technology influence the level of technology use in schools. Research has shown that teachers' attitude towards teaching aids or subject matter have an influence on their pedagogical decisions and practices (Handal, 2003; Neiss, 2006). Similarly, teacher attitude towards instructional technology, knowledge about technology, and level of training in the integration of instructional technology can have an influence on the implementation of technology in school classrooms. This implies that teachers must have a positive attitude towards integration of instructional technology in order to use it in the classrooms, and subsequently enhance students' understanding of subject matter.

It is also evident from the literature that most studies on teachers' attitude and use of technology have mainly focused on big city teachers. Very little research has reported on the rural teachers' attitude and use of instructional technology in their classrooms (Al-Zaidiyeen, Mei & Fook, 2010; Cullen, Brush, Frey, Hinshaw & Warren, 2006). Furthermore, there are few studies done on rural teachers' implementation of instructional technologies in their classrooms as the result of their training experience in mathematics and science PD programs. It is against this background that this study examined rural middle school math and science in-service teachers' PD to integrate technology in classrooms.

The purpose of this study was to (a) investigate rural middle school teachers' implementation of instructional technology in their classrooms, and (b) identify technology integration PD training needs for in-service rural middle school math and science teachers. This study was guided by the following research questions:

1. What are rural middle school teachers' perceived technological skills?
2. What are rural middle school teachers' perceptions on instructional technology training?
3. What are rural middle school math and science teachers PD experience as provided by schools and/or school districts?

Significance of the Study

As teachers use modern technology learned through various gatherings and PD's on technology use, and students learn and perform better because of technologically enhanced teaching methods, there is a likelihood that some schools will satisfy International Society for Technology in Education (ISTE) and Common Core technology integration requirements in math and science through improved student performance. This study provides experiential learning opportunities bound by college-level content and anchored in reflection and dialogue on issues pertaining to attitude, integration of technology and access to technology by teachers in their classrooms which ultimately impact students achievement.

Other studies have shown that there is a correlation between teachers' expertise and student achievement. However, this current study delves into getting to the core of what rural middle school teachers do and how they want to implement technology in their schools. As such, having and encouraging PD offers the potential for developing teacher expertise and improving teacher familiarity with technology. On the other hand, despite the extensive research on instructional technology, there is little evidence of how PD training affects rural teacher integration of technology, technology integration in classrooms and access to technology in relation to effective teaching and student achievement. Most rural schools, due to size of the communities, lack of resources and location do experience financial instabilities and teachers are unlikely to receive PD training in various areas of teacher growth, which in turn pose as barrier. Therefore, findings from the teachers may present the importance of specific technologies in shaping the instructional use of technology and maximize how rural school districts; schools and teachers shape technology initiatives, and its usage in classrooms.

Literature review

Access to Technology and perceptions on training

Access to technological resources by teachers involves two factors: Access to the computers themselves and access to other various electronic/technological teaching tools. Electronic teaching tools include hardware and programs (e.g., Smartboards, Clickers, PowerPoint, Notebook, iPads and Tablets, and Projectors) and information resources (e.g., e-mails and the Internet, online encyclopedias and databases). In this section, the researcher looked at how access to technology affects instructional delivery among rural middle school math and science teachers. Researcher also looked at how access or lack of access affects teachers' discourse on technology in general. However, owning, or having access to technology is mostly only a step. Even more important is learning how to use it for instruction purposes as a teacher for pedagogical purposes. This is one of the biggest challenges faced by most teachers who wish to use electronic tools, because the knowledge is not always easy to acquire. Access to technology is not equitable across sociodemographic categories since it is determined by resources available to the schools, communities, and households. New technologies seem to best accommodate those who already take advantage of available educational opportunities. It is possible that use of these technologies may widen the educational gap in such a way that "advantage magnifies advantage" (Gladieux & Swail, 2010). To add to this obstacle, technology and internet access among individuals with high income and affluent communities is greater, while access among low-income families, some rural communities, and some segments of lowly educated communities is alarmingly low. According to a study conducted by Du, Havard, Sansing, and Yu (2002), they found that access to technology more especially internet is not equitable across socio-demographic categories since resources available to the schools, communities, and households determine what is available to them. However, recent studies by the PEW Research Center have found that there are changes due to the introduction of smartphones (Zickuhr & Smith, 2012).

Considering that some students do not have access to computers or other forms of instructional technology (e.g. internet) at home for use out of school environments, even if they do, they might not have right educational software on such computers. Therefore, technology integration in schools becomes the only source of such and can change not only the way classrooms appear, but also how students with or without computers at home access technology (The Digital Librarian, 2010). This also influences how teachers teach and how students learn. However, obstacles continue to exist related to teacher and student use of technology in meaningful ways for instruction in some rural communities, hence the need for more research in this area not only for learning more about computer related technologies and various software but also on how teachers use technology, and the training needs for teachers. Lowther, Inan, Strahl and Ross (2008) cited availability and access to computers, availability of curriculum materials, teachers' technological and content related technology and knowledge for pedagogical use, administrative and peer support as obstacles to full implementation of technology in some rural schools. Availability and access to computers (Barron, Kemker, Harmes, & Kalaydjian, 2003; Norris, Sullivan, Poirot, & Soloway, 2003), availability of curriculum materials, teachers beliefs (Ertmer, 2005; Lumpe & Chambers, 2001; Vannatta & Fordham, 2004; Wozney, Venkatesh, & Abrami, 2006), demographic characteristics of teachers (Bebell, Russell, & O'Dwyer, 2004; Van Braak, 2001), teachers' technological and content knowledge (Pierson, 2001), and technical, administrative, and peer support Reilly, 2004 and ten years ago, Today, although the problem of availability has been reduced, increasing availability of technology do not necessarily translate into use by teachers (Toit, 2015). In Morehead and LaBeau's (2005) research, they stated that, "there are many reasons for the lack of deeper knowledge of technology integration by teachers, including teacher apathy, district budget limitations, lack of leadership, and lack of availability of training. Yet, the greatest inhibitor to technology is integration time" (p. 2). Time for training, time for PD, time for integration and time for troubleshooting.

To alleviate such hurdles, the Department of Education instituted programs like Enhancing Teaching Through Technology (ETTT) initiative which mandated an active engagement by schools and districts in; (a) implementing proven strategies for integrating technology into curricula and instruction; (b) supporting high-quality PD activities to facilitate such integration; and (c) examining the conditions under which technology showed some effectiveness in increasing student achievement and teacher performance.

Professional development on teacher use of technology

Research has revealed that less than 33% of teachers surveyed feel prepared to integrate technology into the classroom and in other studies that produced better results. It has been found that a vast majority of teachers still felt inadequate in using computers (NEA, 2008; Norman, 2000; NCES, 2000). However, pre-service and in-service teachers taking college technology integration courses had a higher comfort level, confidence, and attitude toward the use of computers, and were more inclined to integrate new technologies into their classrooms (Ross, Hogaboam-Gray, & Hannay, 2001).

Desimone, Porter, Garet, Yoon and Birman (2002) found that PD which focused on specific instructional practices increased teachers' use of those practices in the classroom. They also found that specific features, such as active learning opportunities, increased the effect of the PD on teacher's instruction. By increasing PD, teacher's abilities to provide input into the technology implementation process may increase the number of teachers embracing technology as a result of acquired strategies from PD training and mentoring. In another studies by Espinosa and Chen (1996) and then again by Di Benedetto (2005), participating teachers modified their classrooms to make them more appropriate, and increased their use of computers for their own PD and for curriculum enhancement. However, Lawless and Pellegrino (2007) metadata analysis found that there is a long way to go in understanding methods of effective practice with respect to the various impacts of technology PD for teachers on teaching and learning. On the other hand, Ince, Goodway, Ward and Lee (2006), found that technology intervention produced significant gains in total technology competency, integration of technology competency, and affinity to technology from pre- to post-intervention. As such, Ince et.al (2006), asserted that teachers in the field must be trained to use the new technologies that exist and to integrate them into their instruction in ways that support and enhance their instructional goals without inhibiting them.

Similarly, Watson in 2006 investigated the effect of PD on teachers' long-term interest in technology integration. Watson found that teachers improved the level of interest after the summer workshops. The level of interest remained high even years after their involvement in the program. To support the phenomena of PD, Swan and Dixon (2006) also stated that mathematics teachers who participated in a mentor-supported PD program increased the amount and level of technology use in their practice. Swan and Dixon (2006) reported that levels of accommodation, interest, comfort and confidence related to the use of technology improved, though teachers continued to be concerned with barriers such as lack of release time for training, planning and collaboration, and a need for ongoing support. It was also found that when teachers perceived there was not enough time for training or a lack of technological resources they did not make an effort to become technologically proficient.

As shown in the literature above, PD on technology has an effect on teachers' understanding of technology familiarity and, technology integration skills, interest in technology and abilities to integrate technology. However, not one of the studies reviewed above mentioned or sampled particularly rural schoolteachers' use of technology in their schools due to PD provided by districts or schools. Therefore, this study investigated rural middle school science and math teachers' implementation of instructional technology in their classrooms; assessed teachers' familiarity to instructional technology; and identified technology training needs for in-service rural middle school mathematics and science teachers through PD.

Context of the study

The study was conducted in two math and science teacher PD projects at one large Midwestern state university: Science, Mathematics and Action Research for Teachers (SMART) and Southern Illinois Partnership for Achievement in Mathematics and Science (SIPAMS). Participants in these projects were certified to teach elementary and middle school science and mathematics.

The SMART project is one of the Mathematics and Science Partnership graduate program projects funded by the US Department of Education. The fundamental goals of both these programs were to improve mathematics and science teaching and learning in participating schools by providing PD programs that focused on content and pedagogy, curriculum articulation, reading in content areas, assessment, instructional technology and mentoring. Both projects' goals and objectives were aligned towards teacher improvement and Mathematics and Science Partnerships benchmarks of increasing expertise in specific science and mathematics content; confidence and effectiveness in teaching science and mathematics content with the integration of technology.

Due to the need to hire, train and retain highly qualified teachers of math and science in some areas, these two programs catered for schools that had greater than average difficulty in hiring highly qualified teachers in science and mathematics and those that were deemed not to be meeting Adequate Yearly Progress (AYP) - in many cases their students were not passing state standardized tests. Both projects were conducted through PD activities in summer with four follow-up sessions during the school year, in each of the school year.

Methodology and Participants

This study uses a concurrent exploratory mixed method to collect and analyze data. The study uses a descriptive statistics and qualitatively to report results. For this study, twenty one (63) middle school math and science teachers from Southern Illinois region (classified rural area) responded to a purposefully selected open-ended questionnaire. There were 42 females and 21 males. The age range was 22 through 50. Their teaching experience ranged from 1 to 20 years. Grade levels taught by the participants were between second grade and eighth grade. The data was collected qualitatively and was analyzed using open-coding and reported statistically descriptive narratively. Data was collected using a modified Clark (2000) survey. The survey was designed to gather data about teacher use of technology, technology training needs for teachers, and instructional technology teachers are implementing in their classrooms. The survey had two sections. The first section gathered demographic information about the teacher's teaching experience, subject area taught, whether he or she used a computer at home and at school, and experience with computers and cumulative hours of technology use and training. The second section had open-ended survey questions about technology use which allowed respondents to elaborate on their responses and discuss teacher classroom administrative duties, ways students' educational needs have been met using technology, and listing of suggestions regarding the use of educational technology in classrooms, schools and district wide. Other survey questions discussed how teachers felt about the usefulness of instructional hardware and software and applications in their classrooms and their satisfaction with the training they had received about the use of the equipment and software. This section also included a space for comments or suggestions about educational technology training needs. Surveys were administered through survey monkey and teachers responded electronically. The survey was taken during teacher workshops in summer 2014. Participants taught Math and science but some had more than one subject.

Table 1 shows the distribution of the participants' grades taught, teaching experience, number of science courses taken in high school and number of courses taken in college or university. Nineteen percent (19 %) of the teachers reported teaching K-5th grades while (80.9%) reported teaching 6th - 8th grades. Teaching experience of participants was 1 year to 20 years of teaching service. Apart from the general demographic data, data about technology training done by school districts and from teacher education programs was captured. Training hour as conducted by their school districts had (76.2%) having less than 10 hours of training, (23.8%) having between 11 to 30 hours of training and (0.0%) percent had training more than 30 hours. Training hours in technology at university level ranged was reported to be (52.4%) had 0 to 10 hours of training. Additionally, (28.6%) hand training ranging from 11 hours to 30 hours, while only (19.0%) had over 31 hours of technology training while at university. However, these teachers are all certified to teach content at middle school level in Illinois.

Table 1 *Number and Percentage of Teachers in each Sub-group*

Sub-groups	Ranges	Number of participants	Percentage
Grade taught	K-5th	12	19.1
	6th-12th	51	80.9
Teaching experience	1-5 years	24	38.1
	6-10 years	33	52.4
	11+ years	6	9.5
Number hours of technology training at District level	0-10 hours	48	76.2
	11-30 hours	15	23.8
	31 + hours	0	0.0
Number of hours of technology training in university	0-10 hours	33	52.4
	11-30 hours	18	28.6
	31+ hours	12	19.0

N=63

Results

Although there was no empirical data to verify teacher responses on technological skills, using teacher self-report indicated that teachers had high skill levels of knowledge of using educational hardware. To respond to research question one, the results reported that (66.7%) of teachers had high skills in working with educational technology tools like computers, projectors, Smart boards and others. However, there was very little relationship between teacher skills on hardware and school district training as most of the technological skills and knowledge was from the teachers' university training as students or other sources including self-teaching and not from school districts' PD programs. And in table 1, the results show that (76.2%) of respondents received less than 10 hours of training at school district level.

Table 2. Overview of teacher skill levels in educational technology hardware.

Perceived Skill level using educational hardware	Response %
Low	0.0 (0)
Middle	28.6 (18)
High	66.7 (42)
No Response	4.7 (3)

In table 2, there were no teachers that reported having low technology skills on educational hardware. Although results show that one participant did not respond to this question, the response was overwhelmingly high on skills.

Table 3. Overview of teacher skill levels in educational software/Apps.

Perceived Skill level using educational software/Apps	Response %
Low	9.5 (6)
Middle	57.1 (36)
High	33.3 (21)

Table 3 shows that only half the number of respondents that showed high skills in educational hardware reported same skills on the use of the software and various applications. The report showed that there were more teachers with middle level skills on technology and 6 of them reported having low level skills.

Table 4: Number of estimated accumulated hours teachers had in PD programs conducted by school districts on educational hardware.

Training hours on educational hardware at School District level	Response %
0 - 10 hours	76.2 (48)
11 – 30 hours	23.8 (15)
31 – 59 hours	0.0 (0)
60 & above	0.0 (0)

Table 4 results on hardware training provided through PD by school districts shows that (76%) of respondent received less 10 hours training on the usage of educational hardware technology. Less than (24%) state that they had received between 11 to 30 hours of PD on educational hardware. There was no respondent who indicated having more than 30 hours of training despite years of experience or time spent in the districts.

Table 5. Number of estimated accumulated hours teachers as students at university level on educational hardware.

Training hours on educational hardware at University level	Response %
0 – 10 hours	47.6 (30)
11 – 30 hours	28.6 (18)
31 – 59 hours	19.1 (12)
60 & above	0.0 (0)
No response	4.7 (3)

Report on hours of training on hardware acquired from university studies is spread out with some respondents indicating that they had more than 30 hours of training on the use of such technology. The spread starts

Table 6. Number of estimated accumulated hours teachers had in PD programs conducted by school districts on educational software/Applications.

Training hours on educational software at School District level	Response %
0 – 10 hours	90.6 (57)
11 – 30 hours	0.0 (0)
31 – 59 hours	4.7 (3)
60 & above	0.0 (0)
No response	4.7 (3)

This table shows how many less hours teachers showed they had in training provided by school districts on various software and applications. From the total of 63 teachers, only three teacher indicated that they had received more than 31 hours of PD on software. The type of software and applications was not asked, but this result shows how much training is needed and in what areas. In this particular study, software and applications training seems to be lacking.

Table 7. Number of estimated accumulated hours teachers as students at university level on educational software and applications.

Training hours on educational software/apps at University level	Response %
0 – 10 hours	50.0 (30)
11 – 30 hours	35.0 (21)
31 – 59 hours	15.0 (9)
60 & above	4.7 (3)

Table 8. Number of estimated accumulated hours teachers in training from other sources outside school districts and/or university level on educational hardware.

Hours teacher training programs on educational software	Response %
0 – 10 hours	90.6 (57)
11 – 30 hours	4.7 (3)
31 – 59 hours	0.0 (0)
60 & above	0.0 (0)
No response	4.7 (3)

Table 9. Number of estimated accumulated hours teachers in training from other sources outside school districts and/or university level on educational hardware.

Other teacher training programs on educational hardware	Response %
00 – 10 hours	76.2 (48)
11 – 30 hours	14.3 (9)
31 – 59 hours	4.7 (3)
60 & above	0.0 (0)
No response	4.7 (3)

On table 9 above, study shows that more teachers had less than 10 hours of hardware training, but three teachers stood out as the only teachers who had more training. This table shows the training outside of school districts and university setting, in essence probably self-taught due to pressure or personal interest.

To respond to research question two, teachers were asked to discuss trainings they had received and to specify types of educational hardware training through a PD program that was done at the school district levels. Most teachers stated that they have had training on: Projectors, Elmos, Promethean boards, active expressions, document cameras, smart boards, computers, equipment (which did not mean much as no specifics were given), educational programs. A respondent (11) went further and expressed that:

"Our school recently put Promethean Boards in every classroom so we have had various workshops on using them and the programs that go with it. We are currently in the process of switching our Grading software so we will have training with that early in the school year. I foresee that we will be given more training on technology in the upcoming years, especially due to the fact that every classroom has a Promethean Board".

Another respondent (19) stated that,

"I've had to learn most of it on my own. Technology professional development is meant for our tech people only, not teachers".
One other respondent (3) stated that,

"We do website training (webinars) I did smart board training".

However, on the negative side, some respondents, e.g. (14) pointed out that: "Not very much" training is offered to them by their districts. Another respondent (19) wrote that "very little training in our district", and one other respondent (5) wrote that "Our school really has not had a lot of tech training" while another respondent (7) stated that "I have not had any formal training other than with the online gradebook at my district level".
To contrast the training attained on hardware between teacher education programs and that offered by school districts, the study also required that respondents do provide responses on training education programs' familiarization to technology and the hours of training. First the teachers provided the technologies modeled to them in colleges. Some of these technologies are: Star tech 1:1 school training, computer equipment, video capturing hardware, CPS, digital cameras, document camera, wireless slates, scanner, SmartBoards, and Verniers. Although very few technologies were cited as some of those they used in teacher education programs as pre-service teachers, the number of hours spent on technology training or familiarization is significantly more than that provided by the school districts.

Discussions and conclusions

To review and in discussion of the key findings by research questions as shown on the tables above:

What are rural middle school teachers' perceived technological skills? Ninety percent of the teachers surveyed indicated that they were ready to operate and use various instructional technologies, but this knowledge was mostly due to personal technology interaction and training during university education and not PD programs offered by their schools and school districts. This also does affect their usage of technology as most of the teachers indicated that they relied on their own experience in using technology or books, asking computer-literate people, and from training held by the university they attended. However, if this help is not available, it means there would be a gap.

What are rural middle school teachers' perceptions on instructional technology training? Through interviews, it was found that teachers perceive instructional technology as being very important for instruction and to students. However, it looked like most of the teachers in their districts did not have enough access to these sorts of training to equip them adequately for the 21st century classrooms. Considering the types of technologies mentioned, like Promethean Boards, it is necessary that every teacher who will use such classes are adequately familiarized and trained to use that technology. With regard to training, the results show that school districts had not put too much emphasis on retraining teachers on the technologies that have become the second nature of our 21st century lives. Therefore, it is very necessary for teachers to have access, and training to these everyday technologies for classroom integration and modeling for pedagogical purposes.

What are rural middle school math and science teachers PD experience as provided by schools and/or school districts? There was a huge gap between university computer training and familiarization to newer technologies acquired through PD programs in rural school districts. Tables 6 shows that from the number of teachers who participated in this survey, 57 had fewer than 10 hours of training through PD offered by the school district, while 30 teachers had between 11 and 59 of training hours acquired at university levels. Only 3 teacher stated that they had over 30 hours of professional development offered by the school districts on educational software which could mean that some districts are trying to keep up with the speed technology is permeating learning. However, the vast majority of teachers indicated that their districts had offered them very minimal PD on educational software and its integration to classroom learning. A slightly higher number, 15 teachers, showed having been trained on technology hardware use through PD organized by school districts. This may indicate that hardware is available and being familiarized to, but there seem to be lesser exposure to software as evidenced by the hours spent on software training. There is a significant difference in teacher training at school district level as compared to university level training on software. This problem seems to have an effect on teachers as newer technologies that were never modeled or familiarized to in college become problematic for them to use in the classrooms.

This indicates a very little evidence of PD provided by the school districts. Teachers indicated that much of their technology knowledge was from their personal training and interest. Some of them indicated that they had some training from teacher education programs, although it was either basic or outdated due to every day changes in technology was all they had to help them in the classrooms. In terms of software and hardware training, most teachers stated that they had only received less than 10 hours of training hours on educational software at school district levels on programs for management and organizing instruction through network servers installed in their laboratories.

However, the findings also show that despite this lack of PD from the districts, teachers reported having acquired some skills in technology and computer skills like using Smart Boards, PowerPoint, Verniers, Microsoft Office, and Web designs. The data suggest that most teachers have access to computer and the internet at home and in schools. However, most school districts offered fewer hours of software/Apps and hardware training as compared to university teacher education programs, this affected teachers' ability and skills to integrate technology in the classrooms. One important response noteworthy is that teachers are training themselves to use some of these technologies. How much more technology would they be skilled in and able to integrate if provided with PD on newer and more variety of instructional technology? More research may be needed to correlate training/PD and usage and student performance due to PD. As long as school districts continue to pile various technologies in the classrooms, they must equate that with the number of hours spent on PD for teachers to be conversant and ready to use these technologies. Also, the monies spent on acquiring the technologies, must be proportional to the money spent on training the teachers to use newly and unfamiliar technologies

Recommendations

There is even a greater need to expand PD in Technology and Integrate Use of Technology as a Learning Tool in Classrooms due to the levels students are operating with technology in their daily lives. Teachers cannot afford to lag even a step behind as this may render them obsolete technologically. Professional development in technology use in rural schools (focus of study) should be a required part of initial teacher licensure. Others have suggested particular attention to be given to the training opportunities provided for educators in urban schools and to newer educators, who in particular believe that technology training in their schools has not been adequate (NEA, 2008). There's a need to expand the limits of technology in the curriculum standards in K–12 education considering the speed at which technology is permeating our education. The curriculum should require teachers together with the students to use technology as an integral part of their class work and in a manner that enhances their creativity and learning of higher-order skills. Rural schools should capitalize on the enthusiasm that educators and students show toward using technology, particularly in rural/small town schools, by seeking more ways (i.e. PD training) to use technology for the greatest gain in student achievement. Increasing hours of training might not be enough, but if teachers are exposed to the prevailing educational technologies and the pedagogy, teachers are likely to use it or try it with students.

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