TEACHERS' PERCEIVED ABILITY TO INTEGRATE TECHNOLOGY INTO THE INSTRUCTIONAL SETTING

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Abstract

Background: *The researchers in this study observed that little or no effort is made by administrators to evaluate the technology expertise of the teachers who are responsible for integrating software applications into the instructional environment. Not only is it important that teachers have expertise in using these technologies, they must also be able to integrate them into the instructional setting so that they can foster meaningful learning.* ***Objective:*** *The purpose of this study was to assess teachers' perceived expertise in using word processing, spreadsheet, and presentation software applications to facilitate instruction. Word processing, spreadsheet, and presentation software applications have become necessary skills in today's teaching, learning, and research environments. Yet, do teachers have competence in using and integrating these technologies into insurrection?* ***Methodology:*** *The participants were 313 teachers who taught in the rural schools. The instrument for data collection was validated by leaders in technology integration; Cronbach's alpha was used to establish the internal consistency of .95.* ***Findings:*** *The results indicated that the participants' responses to 30 general statements related to their ability to provide instruction using word processing, spreadsheet, and presentation applications indicated that they did not express competence in over half of the questionnaire items.* ***Conclusion:*** *Majority of the participants acknowledged that they lack competence to use these software applications to facilitate instruction.* ***Recommendation:*** *Technology trainers can send a diagnostic questionnaire to teachers prior to the training session aimed at determining their (teachers) strengths and weaknesses so that these weaknesses can be addressed during the training sessions.*

Introduction

As new instructional technologies emerge, most educational institutions struggle to make these technologies available to their teachers. The researchers in this study observed that little or no effort is made by administrators to evaluate the technology expertise of the teachers who will be responsible for integrating the new technologies into the instructional environment. Not only is it important that teachers have expertise in using these technologies, they must also be able to integrate them into the instructional setting so that they can foster meaningful learning.

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As technology advances with breathtaking speed, schools continually try to catch up. By having access to a variety of social networks, most students use new technology on a daily basis as they integrate a variety of media through what they see as routine communications. They (students) create, share, and edit documents online; blog to interact with others as they post their opinions, comments, photos; and generate online presentations to communicate their ideas with sound, images, and video. They learn and use the technology they see as useful to them at the time.

Few schools evaluate teachers' actual or perceived technology competence. In most cases it is assumed that teachers keep up to date through advanced education, training, and experience. Facilitating instruction using technology is a process that encompasses several steps. Its most basic steps include presenting the technology, practice using the technology, feedback from the teacher or others, and application of the technology in a realistic setting. However, teachers' use of technology to support instruction may be hampered if they lack the competence to use technology themselves, including the knowledge and the ability to use appropriate pedagogical principles to implement technology integration (Okojie, Olinzock, & Boulder, 2006).

A report from the National Center of Educational Statistics (NCES, 2002) indicated that about a third of the teachers from elementary schools in the United States are not adequately prepared to use computers and the Internet to facilitate instruction. The report also indicated that less experienced teachers feel more positive in implementing computer technology than those with more teaching experience. The more experienced teachers are, in most cases, older. While it is acknowledged that younger teachers are more familiar with technology, it is important to recognize the need to collect data on how all teachers perceive their ability to use and integrate technology in the classroom setting.

Ronnkvist, Dexter, & Anderson (2000) reported that teachers need assistance with both technical support and instructional delivery to ensure effective implementation of technology integration. Schools cannot hope to improve the academic achievement of students or the overall value of programs without quality technology integration. As Donahoo and Whitney (2006) remarked, no educational institution can really make progress in their various programs without successful technology integration by teachers who provide instruction.

Statement of the Problem

Word processing, spreadsheet, and presentation software applications have become necessary skills in today's teaching, learning, and research environments. Yet, do teachers have competence in using and integrating these technologies? For technology to be integrated successfully into teaching and learning, teachers not only need to understand the basic skills, but also need to understand how (methods/techniques) technology can be integrated into the curriculum (Baylor

& Ritchie, 2002, Becker, 2001; Roberts, 2003). According to Becker (2001), "… the ways that teachers have their students use computers are certainly affected by their own level of technical expertise" (p. 4).

This study was designed to assess teachers' perceived skills in using word processing, spreadsheet, and presentation software applications as integrated teaching tools. The findings can be used to assist individuals in developing appropriate instructional materials that could address teachers' needs and weaknesses. A secondary purpose of this study was to determine if differences exist among teachers in their perceived skill in implementing technology integration based upon gender and age.

Research Questions

The following questions guided this study.

1. How do teachers evaluate their ability to facilitate instruction using word processing, presentation, and spreadsheet software applications?
2. Do statistical differences exist among teachers in their perceived ability to facilitate instruction using word processing, presentation, and spreadsheet software to facilitate instruction based upon gender?
3. Do statistical differences exist among teachers in their perceived ability to facilitate instruction using word processing, presentation, and spreadsheet software to facilitate instruction based upon age?

Educational Significance

In order to provide appropriate technology training for teachers, technology trainers must know how these individuals (teachers) perceive their skill competence and their ability to integrate software applications into the teaching and learning environment. Quite often trainers assume that they know what teachers or trainees need as they prepare materials. Understanding teachers' needs through research initiatives will provide opportunities for trainers to diagnose teachers' needs and to provide appropriate instruction during professional development training. The researchers believe that teachers will learn more effectively if they are involved in their training because, as Knowles, Elwood, and Swanson (1998) state:

> …adults resent and resist situations in which they feel others are imposing their wills on them. In spite of their need for autonomy, previous schooling has made them dependent learners. It is the job of the adult educator to move adult students away from their old habits and into new patterns of learning where they become self-directed, taking responsibility for their own learning and the direction it takes (p. 65).

According to Fullan (2001), educational technology failed because integrating technology into teaching and learning did not take into consideration the cultural

climate of schools. Perhaps, each individual school might do well to consider school climate culture as it implements technology integration.

Review of Related Literature

Computer technology has permeated all aspects of our economic and social lives, including educational practices. Educational institutions continued to strive to make technology the center piece of instructional tools. The challenge to integrate technology into the classroom continues to be an on-going concern. Since teachers direct classroom activities, teacher education, too, must address the integration of technology in the learning environment. Many school systems have invested large sums of money to provide technology training sessions and workshops for teachers. Woodbridge (2004) explained that computer technologies have been considered educational tools for over 40 years. During these years, public school systems and state and federal governments have spent billions of dollars to integrate technology into teaching and learning (Franklin, Turner, Kariuki, & Duran 2001). Zuniga (2010) pointed out that over $2.8 billion has been spent on technology infusion from 2002 to 2008. Zuniga also pointed out that out teachers have the desire to use technology to facilitate instruction, but lack of experience and lack of knowledge of technology integration inhibited their desire to do so..

Littrell, Zagumny, and Zagumny (2005) argued that teachers are not yet in a position to use technology for teaching and learning effectively. Before it can be possible to determine whether technology integration is effectively implemented in the public schools, more research studies are needed to determine teachers' needs in terms of technology training. Technology integration is not a static concept, but rather it is transformational; it changes as knowledge grows.

Discussing some of the views expressed by teachers on technology infusion, Zuniga (2010) stated that out of the 30 teachers who participated in his qualitative research, nine (30%) rated their computer skills between one and three on a ten-point scale, with one being the lowest and ten the highest. Zuniga reported that a rating in this range indicated that these teachers were hesitant in using computers for instruction. Eight out of the 30 participants rated their computer knowledge between four and seven, a rating that indicated moderate use; while 13 rated their knowledge between eight and ten which showed that they considered themselves knowledgeable in using computers. According to Zuniga, one teacher who participated in the study indicated that her school district explained the importance of computers in education and encouraged teachers to use computers for instruction. However, the teacher maintained that there was no evidence that computers were being used in the classrooms. Zuniga also reported that another teacher admitted that computer resources were available for use in the classrooms, but she did not use them because she did not know how to use

computers. The views expressed by these teachers showed that the availability or lack of availability of computer technologies in the classrooms was not the only obstacle to technology integration. Teachers need regular training and frequent encouragement and reinforcement if technology integration is to be successful. The availability of classroom computers, alone, does not ensure that technology integration will take place.

Wilmore and Betz (2000) argued that "information technology only will be successfully implemented in schools if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change" (p. 15). The study by Zhao and Bryant (2005) indicated that teachers believed that technology mentorship and follow-up training have helped them to "move beyond basic personal use of word processing and the Internet to more complicated use of computer technology, including advanced functions in word processing and programs such as Excel, Publisher, and PowerPoint…." (p. 57).

The importance of technology integration training and follow-up training activities cannot be over-emphasized. However, it is equally important to recognize that technology trainers understand the technology needs of the trainees prior to training. It is believed that technology integration training could be more effective if the focus is on the trainees and what they need rather than on the trainers and what skills they can provide. This was echoed by teachers involved in the qualitative study carried out by Zhao and Bryant (2005):

> "It was easier [to integrate technology] because I could tell her what we're studying and she would give suggestions. Then we would come up with a plan.
>
> This has been infinitely different because of the one-to-one help I received from TIS [the specialist]. A difference also existed in the fact that there was an immediate chance to try new skills with real-life students in a classroom setting.
>
> It allows more flexibility and a chance to focus on specific student/teacher needs rather than just a general lesson that works for some and not at all for others.
>
> Technology support is far more beneficial than taking a general class (p. 59).

The present study was designed to assess teachers' perceived ability to integrate basic word processing, presentation, and spreadsheet software applications, and to determine if differences exist among teachers perceived ability based on gender and age. Casey and Rakes (2002) explained that teachers who receive continuous training are more likely to use technology to facilitate instruction than those who receive infrequent technology integration training.

Research Methodology

Research Design

The design of this study was a survey questionnaire. Survey design is a self-reporting method of data collection. Gay, Mills and Airasian (2012) acknowledged that a survey represents one of the ways used to collect information, or data, on people's opinions to describe certain characteristics of a given population. This study was about teachers' opinions regarding their perceived ability to integrate technology into instruction; therefore, survey design was considered the appropriate design for this study.

Research Participants

Seven schools in four counties were involved in this study; they were located in one of the southern states of the United States. The researchers received permission from the superintendents of each school district as well as the principals of each school involved in the study for teachers to complete the questionnaire. Teachers who participated in the study volunteered to do so. Most schools participating in the study were located in the rural areas. A total of 589 teachers from various types of schools completed the survey; however, 313 (53%) surveys were complete and usable as shown in Table 1. The researchers visited each school twice. As shown in Table 1, the majority of the participants, 42.8%, were from elementary schools.

Table 1
Distribution of Teachers by Type of School and Percentages

Types of Schools	Number of Teachers	Percentages
Elementary Schools	134	42.8
Middle Schools	85	27.2
High Schools	85	27.2
Career and Technical Schools	4	1.3
Missing Data	5	1.6

Instrumentation

A survey questionnaire was used to collect data for this study. The questionnaire was reviewed and validated by two (2) professionals in the field of education who have experience in using technology to facilitate instruction. The purpose of the review was to make sure that the questionnaire items were meaningful and clear.

The questionnaire was divided into two sections. Section A was used to gather demographic information, and section B was used to collect data on teachers' perceived ability to integrate software applications into teaching and learning. The questionnaire used for this study contained 30 items, and it was based on a 5-point Likert scale. The questionnaire was completed by 27 teachers in a pilot study on two occasions to establish the internal consistency of the questionnaire; those teachers did not participate the actual study. The internal consistency of the questionnaire items for the first administration was .71. The researchers observed that several questionnaire items received inconsistent ratings. As a result, the researchers revised and/or replaced those questionnaire items. The questionnaire was administered to the same teachers again, and the Cronbach's alpha result was .95.

Data Analysis Procedure

Data was analyzed using mean scores, percentages, t-tests, and ANOVAs, including Turkey HSD Post hoc tests. The t-Test was used to determine if statistical significant differences existed between female and male participants in their responses to questionnaire items. The ANOVA was used to identify differences among groups of the participants based on eight age groups. HSD Post hoc tests were used to determine where difference existed among the different age groups represented in the study.

Data Analysis

Participants' Demographic Data

Table 2 shows the distribution of participants by gender, ethnicity, and age. The majority of the participants were female, 221 (70.60%) and Caucasians 221 (70.60%). The age of the participants ranged from 20 years to 56 years and above.

Table 2
Distribution Participants' Demographic Data by Frequencies and Percentages

Demographic Variables	**Frequencies**	**Percentages**
Gender		
Female	221	70.60
Male	91	29.07
Missing Data	1	.31
Ethnicity		
Caucasians	221	70.60
African American	73	23.32
Hispanic American	1	.31
Asian Americans	2	.63
Missing Data	16	5.11
Age		
20-25	31	9.90
26-30	3	.95
31-35	35	11.02
36-40	52	16.06
41-45	29	9.03
46.50	30	9.06
51-55	48	15.03
56 and above	54	17.02
Missing data	31	9.90

Research Question 1

Research Question 1 was: How do teachers evaluate their ability to facilitate instruction using word processing, presentation, and spreadsheet software applications? Participants evaluated their skill on a 1 to 5 scale with 1 representing strongly disagree and 5 representing strongly agree.

The results indicated that the participants did not perceive that they possessed the skill to teach more than half of the items listed on the survey; they reported Undecided or Disagree ratings for 16 of the 30 items as shown in Table 3. They did not strongly disagree or strongly agree on any item on the instrument. The highest mean score, 4.29, was for Question 1: *I possess the skill to teach students how to create documents using word processing software.* The lowest mean score, 1.90, was for Questionnaire item 2*: I possess the skill to teach students how to format documents using word processing software.*

Table 3
Participants Mean Scores for Survey Items Used to Facilitate Instruction

Questionnaire Items			
Word Processing Software	**N**	**Mean Scores**	**SD**
1 –I possess the skill to teach students how to create documents using word processing software.	311	4.29	.950
2 –I possess the skill to teach students how to format documents using word processing software.	312	1.90	1.081
3 –I possess the skill to teach students how to edit documents using word processing software.	313	4.20	.981
4 –I possess the skill to teach students how to merge documents using word processing software.	312	3.69	1.205
5 –I possess the skill to teach students how to edit documents using word processing software.	308	3.89	1.232
6 –I possess the skill to teach students how to insert symbols using word processing software.	310	3.82	1.232
7 –I possess the skill to teach students how to attach documents to e-mail.	308	3.96	1.269
8 –I possess the skill to teach students how to use tracking tools to make changes using word processing software.	310	3.29	1.248
9 –I possess the skill to teach students how to use drawing tools using word processing software.	310	3.35	1.332
10 – I possess the skill to teach students how to organize documents using word processing software.	311	3.78	1.138
Presentation Software			
11 –I possess the skill to teach students how to use presentation software.	311	3.72	1.217
12 –I possess the skill to teach students how to select appropriate design templates based on the instructional goals.	311	3.61	1.221
13 –I possess the skill to teach students how to change the size of images inserted into presentation software.	310	3.55	1.325
14 –I possess the skill to teach students how to change slide designs using presentation software.	308	3.56	1.334
15 –I possess the skill to teach students how to apply slide transition effect to slides using presentation software.	310	3.59	1.263
16 –I possess the skill to teach students how to insert sound using presentation software.	307	3.38	1.367

Table 3 *(continued)*

Questionnaire Items			
Presentation Software	**N**	**Mean Scores**	**SD**
17 –I possess the skill to teach students how to insert animation using presentation software.	308	3.37	1.348
18 –I possess the skill to teach students how to insert charts using presentation software.	309	3.30	1.280
19 –I possess the skill to teach students how to change the order of slides using presentation software.	309	3.64	1.268
20 –I possess the skill to teach students how to format a chart by changing color of the plotted area.	306	3.09	1.379
Spreadsheet Software			
21 –I possess the skill to teach students how to input data using spreadsheet software.	308	3.35	1.341
22 –I possess the skill to teach students how to modify data on a spreadsheet.	309	3.31	1.332
23 –I possess the skill to teach students how to use data to create pie charts using spreadsheet software.	308	3.07	1.365
24 –I possess the skill to teach students how to insert rows, columns and cells on a spreadsheet.	308	3.48	1.352
25 –I possess the skill to teach students how to perform arithmetic functions using spreadsheet software.	309	3.08	1.315
26 –I possess the skill to teach students how to copy a range of cells on a spreadsheet.	308	3.36	1.351
27 –I possess the skill to teach students how to delete rows and columns on a spreadsheet.	309	3.51	1.340
28 – I possess the skill to teach students how to sort a list on a spreadsheet.	308	3.17	1.365
29 – I possess the skill to teach students how to use various functions using spreadsheet software.	306	3.09	1.379
30 – I possess the skill to teach students how to use formulas to perform various mathematical calculations on a spreadsheet.	308	3.35	1.341

Research Question 2

Research question 2 was: Do significant differences exist among teachers in their perceived ability to use software application tools to facilitate instruction based on gender? A confidence level of .05 ($p. < .05$) was set a priori for all statistical tests.

In the area of word processing, female respondents had significantly higher scores for questionnaire items 1, 3, 5, 6 and 7 than male participants as shown in Table 4. For questionnaire item 2, male participants had a significantly higher score than female participants. No significant differences were found for any of the presentation or spreadsheet skills listed on the questionnaire based on gender.

Table 4
t-Tests for Word Processing Questionnaire Items Based on Gender

Survey Item	Mean – Male	Mean – Female	t	p.
Q1 –I possess the skill to teach students how to create documents using word processing software.	4.02	4.41	2.88	.01*
Q2 –I possess the skill to teach students how to format documents using word processing software.	2.11	1.81	2.07	.05*
Q3 –I possess the skill to teach students how to edit documents using word processing software.	3.98	4.29	2.37	.05*
Q5 –I possess the skill to teach students how to edit documents using word processing software.	3.36	4.00	2.36	.05*
Q6 - I possess the skill to teach students how to insert symbols using word processing software.	3.56	3.94	2.36	.05*
Q7 –I possess the skill to teach how to attach documents to e-mail.	3.59	4.11	3.03	.01*

*p. < .05

Research Question 3

Research Question 3 was: Do significant differences exist among teachers in their perceived skills to use word processing, spreadsheet, and presentation software to facilitate instruction based on age? The participants were divided into eight groups based on age: 20-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55, and 56 or higher. The researchers used an ANOVA to determine if significant differences existed for any questionnaire item based on age, and Tukey HSD Post hoc tests were used to determine where the differences existed. As shown in Table 5, with the exceptions of questionnaire items 20 and 25, significant differences were found for all items at p. < .05. The participants were undecided for

questionnaire items 20, and 25. The three lower age groups 20-25, 26-30, and 31-35 did not differ significantly from one another, and the three higher age groups 46-50, 51-55, and 56+ did not differ significantly from one another. For items on the questionnaire that showed a significant difference based on age, the three lowest age groups differed significantly from the three highest age groups, with the lower age groups indicating that they felt more competent in using software applications in teaching than older participants.

Table 5
ANOVA Tables for Questionnaire Items Based on Age

Word Processing						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Q1	Between Groups	38.160	7	5.451	7.116	.000*
	Within Groups	229.059	299	.766		
	Total	267.218	306			
Q2	Between Groups	46.490	7	6.641	6.613	.000*
	Within Groups	301.302	300	1.004		
	Total	347.792	307			
Q3	Between Groups	38.143	7	5.449	6.682	.000*
	Within Groups	245.449	301	.815		
	Total	283.592	308			
Q4	Between Groups	59.643	7	8.520	6.711	.000*
	Within Groups	380.877	300	1.270		
	Total	440.519	307			
Q5	Between Groups	32.183	7	4.598	3.231	.003*
	Within Groups	421.238	296	1.423		
	Total	453.421	303			
Q6	Between Groups	27.881	7	3.983	2.765	.008*
	Within Groups	429.272	298	1.441		
	Total	457.154	305			
Q7	Between Groups	50.119	7	7.160	4.954	.000*
	Within Groups	427.763	296	1.445		
	Total	477.882	303			

Table 5 *(continued)*

		Sum of Squares	df	Mean Square	F	Sig.
Word Processing						
Q8	Between Groups	23.886	7	3.412	2.259	.030*
	Within Groups	450.052	298	1.510		
	Total	473.938	305			
Q9	Between Groups	37.649	7	5.378	3.179	.003*
	Within Groups	504.233	298	1.692		
	Total	541.882	305			
Q10	Between Groups	41.245	7	5.892	5.059	.000*
	Within Groups	348.234	299	1.165		
	Total	389.479	306			
Presentation						
Q11	Between Groups	77.190	7	11.027	8.889	.000*
	Within Groups	370.907	299	1.240		
	Total	448.098	306			
Q12	Between Groups	69.451	7	9.922	7.756	.000*
	Within Groups	382.471	299	1.279		
	Total	451.922	306			
Q13	Between Groups	42.519	7	6.074	3.672	.001*
	Within Groups	492.922	298	1.654		
	Total	535.441	305			
Q14	Between Groups	77.162	7	11.023	7.103	.000*
	Within Groups	459.387	296	1.552		
	Total	536.549	303			
Q15	Between Groups	76.532	7	10.933	7.965	.000*
	Within Groups	409.027	298	1.373		
	Total	485.559	305			
Q16	Between Groups	67.773	7	9.682	5.755	.000*
	Within Groups	496.273	295	1.682		
	Total	564.046	302			

Table 5 *(continued)*

		Sum of Squares	df	Mean Square	F	Sig.
Presentation						
Q17	Between Groups	67.964	7	9.709	5.965	.000*
	Within Groups	481.773	296	1.628		
	Total	549.737	303			
Q18	Between Groups	30.443	7	4.349	2.768	.008*
	Within Groups	466.586	297	1.571		
	Total	497.030	304			
Q19	Between Groups	88.785	7	12.684	9.519	.000*
	Within Groups	395.753	297	1.333		
	Total	484.538	304			
Q20	Between Groups	16.463	7	2.352	1.241	.280
	Within Groups	557.355	294	1.896		
	Total	573.818	301			
Spreadsheet						
Q21	Between Groups	47.450	7	6.779	4.037	.000*
	Within Groups	497.020	296	1.679		
	Total	544.470	303			
Q22	Between Groups	44.124	7	6.303	3.787	.001*
	Within Groups	494.388	297	1.665		
	Total	538.511	304			
Q23	Between Groups	33.766	7	4.824	2.682	.010*
	Within Groups	532.339	296	1.798		
	Total	566.105	303			
Q24	Between Groups	42.066	7	6.009	3.488	.001*
	Within Groups	509.905	296	1.723		
	Total	551.970	303			
Q25	Between Groups	14.292	7	2.042	1.183	.312
	Within Groups	512.659	297	1.726		
	Total	526.951	304			

Table 5 *(continued)*

Spreadsheet						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Q26	Between Groups	47.384	7	6.769	3.965	.000*
	Within Groups	505.353	296	1.707		
	Total	552.737	303			
Q27	Between Groups	65.066	7	9.295	5.763	.000*
	Within Groups	479.046	297	1.613		
	Total	544.111	304			
Q28	Between Groups	58.878	7	8.411	4.919	.000*
	Within Groups	506.171	296	1.710		
	Total	565.049	303			
Q29	Between Groups	29.339	7	4.191	2.567	.014*
	Within Groups	486.608	298	1.633		
	Total	515.948	305			
Q30	Between Groups	43.051	7	6.150	3.703	.001*
	Within Groups	484.949	292	1.661		
	Total	528.000	299			

*p. < .05

Discussion of the Findings and Conclusion

Teachers' responses to 30 general software statements related to their ability to teach students to use word processing, presentation, and spreadsheet applications indicated that they did not express competence in over half of the items. They agreed (a mean of 3.5 or higher) that they felt competent in 14 of the 30 questions, 7 in the word processing area, 6 in the presentation area, and only 1 in the spreadsheet area. This finding supports Littrell, Zagumny, and Zagumny (2005) who believe that teachers do not yet possess the skill to implement technology integration. Keengwe, Onchwari, and Wachira (2008) reported that teachers do not have confidence in using basic software applications in teaching. These authors concluded that computer integration has not been properly and effectively infused into the curriculum activities. Eteokleous (2008) maintained that some of the teachers who took part in her study indicated that they use technology, but remarked that such use does not include any innovative applications.

Female participants reported significantly higher levels of competence in five of the ten areas of word processing than males. However, there were no differences

based on gender for any questionnaire items in the presentation and spreadsheet applications. The findings of this study show that there is a significant difference in teachers' perceived competence in teaching software applications based on age, with younger teachers expressing more competence than the more matured (older) teachers. Eteokleous (2008) explained that teachers still need assistance in using software applications to facilitate instruction. The findings of the present study reveal that there are differences among the age groups; the younger age groups believe that they can teach students how to use some software applications to facilitate teaching and learning while the older participants are undecided and unsure of their ability. Similar findings reported by Naquin (2000) indicate that there are differences between the younger and older instructors in their responses on technology integration. According to Naquin, younger instructors are more optimistic about technology infusion than their older counterparts.

Overall the findings of this study indicated that teachers who participated in this study indicated that they felt some competence in the word processing area, but little competence in presentation and spreadsheet applications. The weaknesses identify can be beneficial to technology trainers as they prepare professional training materials for teachers. In addition, the significant differences in the perceived software application skills based on age suggest that technology training should accommodate and address the impact of age as related to technology integration.

Recommendations

It is recommended that training which involves peer-to-peer learning, collaborative activities, a variety of training materials, and a skilled trainer can provide a learning environment in which individual differences can be accommodated. It is important to remember that training is only one step in the learning process, it is equally important that follow-up training activities in the form of workshops be instituted in order to help teachers consolidate the skill they have acquired. A potential technology trainer can send a diagnostic questionnaire to teachers prior to the training session aimed at determining their (teachers) strengths and weaknesses so that these weaknesses can be addressed during the training sessions. It is recommended that the training materials be based on the trainees' (teachers) needs and weaknesses and not solely determined by the trainer.

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