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Agriculture Teachers' Use of Interactive Whiteboards (IWBs): Teachers' Perceptions of Innovativeness and Technology Integration

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The purpose of this descriptive-correlational study was to assess the level of innovativeness of Oklahoma secondary agricultural education teachers regarding their use of the interactive whiteboard (IWB). The study also sought to determine if relationships existed between teachers' IWB innovativeness scores and selected personal and professional characteristics. The findings of this study revealed that as a teacher's age and years of teaching experience increased, his or her perceived level of innovativeness regarding use of interactive whiteboards (IWBs) decreased. Therefore, younger and less experienced teachers were further advanced in Rogers's (2003) innovation-decision process. In addition, this study found that a majority of the agriculture teachers were in the implementation and confirmation stages of the innovation-decision process. Implications and recommendations point to creating professional development experiences for teachers in the knowledge and persuasion stages of the innovation-decision process to learn about effective use of IWBs, to acquire procedural or "how-to" knowledge of the IWB, and to have opportunities to practice using it. Additional research should examine how the use of IWBs affects student learning and achievement in school-based agricultural education.

Keywords: adoption; agriculture teachers; innovativeness; interactive whiteboard; STEM

Introduction

Technology has transformed the world in which we live now and will continue to transform the world of the future. The use of instructional technologies (ITs) in today's schools may be more important to student success than in previous years. The pupils of today are much different from former generations of students regarding their expectations for the use of technology while

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learning (Brown, 2000; Prensky, 2001; Spires, Wiebe, Young, Hollerbrands, & Lee, 2012; Tapscott, 1998), especially concerning their receipt and use of information. These students have spent their entire lives immersed in technology (Oblinger, 2004; Oblinger & Oblinger, 2006; Prensky, 2001). In fact, technology is assumed to be an important aspect of their everyday lives (Oblinger, 2004), in part, because this new generation of learners thinks and processes information much differently than did previous students (Brown, 2000). According to Oblinger (2004), by the time a student reaches the age of 13, he or she has spent more hours interacting with digital media, such as computers, Internet, and videogames, than watching television.

Numerous researchers have examined differences between generations in regard to their members' use of digital devices (e.g., Carlson, 2005; Howe & Strauss, 2000; Oblinger & Oblinger, 2006; Prensky, 2001). These researchers categorized the *older* generations as *Traditionals/Matures/Baby Boomers/Digital Immigrants* and the *younger* generations as *NetGens/Millenials/NeXt/Digital Natives*. This divide in generations has garnered much attention from educators and researchers (Bennett, Maton, & Kervin, 2008). Therefore, considering these generational differences, are instructors prepared properly to implement ITs in their teaching practices? Research suggests that deficits exist regarding teachers' abilities to use technology in their classrooms effectively (Chen, Lim, & Tan, 2010). Teachers, therefore, regardless of subject or content area, should improve their *technological fit* regarding technology integration (Brown, Baker, Edwards, & Robinson, 2011; Otrel-Cass, Khoo, & Cowie, 2012; Wachira & Keengwe, 2011; Young, Young, & Shaker, 2012).

One effort to bridge this gap between teachers and students is the use of interactive whiteboards (IWBs). IWBs, according to Lewin, Somekh, and Steadman (2008), are extra-large touch screen whiteboards, joined to a classroom computer and visible to the entire class. IWBs allow teachers to access still and moving imagery coupled with sound. In addition, IWBs present a multimedia approach to address the needs of entire classes or individual students. IWBs "are used to challenge pupils to think by using a variety of verbal, visual, and kinesthetic stimuli" (Glover, Miller, Averis, & Door, 2007, p. 11). Incorporating the use of IWBs into classrooms may assist teachers in engaging this new technology-savvy generation of students cognitively and affectively. Researchers (e.g., Croninger & Lee, 2001; Greenwood, Horton, & Utley, 2002; Klem & Connell, 2004) have shown that students who are engaged actively in the learning process learn more effectively and perform better on tests.

Because computerized ITs are integrated increasingly in education, teachers have been faced with new challenges of technical aptitude, knowledge, and expertise regarding their use (Levin & Wadmany, 2008). ITs generate new possibilities and encourage teachers to use such to make teaching and learning even more significant and gratifying (Levin & Wadmany, 2008). Further, Levin and Wadmany (2008) claim that ITs have become the literacy of the 21st century. Numerous teachers, however, have been unhurried about adopting ITs as a pedagogical practice

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(Levin & Wadmany, 2008). One reason may be their overall lack of self-efficacy in regard to teaching (Tschannen-Moran, Hoy, & Hoy, 1998). Bunch, Robinson, and Edwards (2012), however, found that agriculture teachers who integrated instructional technology in their teaching, by way of IWBs, expressed higher self-efficacy more frequently when using technology in their classrooms.

Apprehension of adopting IT by teachers is not a new phenomenon (Zhao & Frank, 2003). Numerous research inquiries (Berge, Muilenburg, & Haneghan, 2002; Gammill & Newman, 2005; Gu, Zhu, & Guo, 2013; Hope, 1998; Levin & Wadmany, 2008; Murphrey & Dooley, 2000; Nelson & Thompson, 2005) provide a substantial list of barriers that affect teachers' use of ITs. These barriers include a lack of time to plan lessons properly involving the use of technology, a dearth of administrative support, and insufficient expertise (Handal, Campbell, Cavanagh, Petocz, & Kelly, 2013; Osman & Bakar, 2012). According to the National Research Council (NRC, 1999), "[m]any who currently use information technology have only a limited understanding of the tools they use and a (probably correct) belief that they are underutilizing them" (p. 1). However, the main reason teachers do not integrate technology is their lack of prior experience in using technology as an instructional tool (Hope, 1998).

Kotrlik, Redmann, and Douglas (2003) found that agriscience teachers' perceptions of barriers were strong predictors of whether they would integrate instructional technologies into their pedagogical practices. But what may be the best ways to assist teachers in overcoming the barriers? Nelson and Thompson (2005) noted that teachers often instruct students in ways similar to their own pedagogical preparation. However, if teachers were not exposed to ITs during teacher preparation programs or through professional development thereafter, their lack of experience may lead to adoption and integration issues. To that end, Brown et al. (2011) asserted that "[i]t is essential that teacher educators take responsibility for training future teachers in a way that equips them with the resources to teach today's digital natives" (p. 1).

Significance of the Study

Today's students are natives of a digital world (Prensky, 2001). They need to perceive a sense of autonomy and be challenged at an appropriate level (Shernoff, Csikszentimihalyi, Schneider, & Shernoff, 2003). The increasing prevalence of technology in U.S. schools is an initiative to which the federal government has committed effort and resources (Lawless & Pellegrino, 2007). To help schools keep up with technological advancements, the federal government has increased its funding efforts to equip schools with technology and make it accessible to students across the country (Lawless & Pellegrino, 2007). This initiative was implemented, in part, because of the view that students need to be engaged at higher levels in the classroom to reach their optimal learning capacity (Marks, 2000).

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One way teachers can engage today's learners is by employing technologies such as IWBs (Kennewell & Beauchamp, 2007; Stewart, Antonenko, Robinson, & Mwavita, 2013). IWBs allow teachers to develop interactive lessons to augment student learning (Miller, Glover, & Averis, 2004). The interactivity fostered by IWBs creates a classroom environment in which students interact with each other (pupil-to-pupil) and the teacher (pupil-to-teacher), model abstract ideas, and become actively involved in learning (Cakir, 2008; Glover & Miller, 2001; Mayer, 2004; Minner, Levy, & Century, 2010).

What is unclear is whether school systems will have teachers who understand how to use the technology appropriately in their classrooms such that student learning is enhanced (Lawless & Pellegrino, 2007). Thus, the digital divide could actually widen over time with the increased investment of technology in schools unless urban and rural K-12 educational settings attract and maintain a teaching force equipped to use technology effectively in support of student learning (Lawless & Pellegrino, 2007, p. 578). It is imperative, therefore, to determine the factors that prevent teachers from using IWBs, because the integration of technology is an innovative process (Lowry, 1997) and will take time to diffuse in classroom learning environments (Lawless & Pellegrino, 2007).

Because agricultural education teachers have access to IWBs (Bunch et al., 2012), this study focused on the factors that impacted their adoption of IWBs. Although research on technology adoption among teachers in agricultural education has been conducted before, the technology being studied and adopted is relatively new and changing rapidly (Murphrey, Miller, & Roberts, 2009). Further, only a small number of studies have been conducted on teachers' use of IWBs in the agricultural education classroom (Bunch et al., 2012). Encouraging teachers to use IWBs requires an understanding of their innovativeness or the likelihood of adopting such practices; therefore, studies should be performed to describe teachers' perceptions of innovativeness regarding their use of IWBs.

Theoretical Framework

The theoretical framework undergirding this study was based on Rogers's (2003) innovation-decision process. According to Rogers (2003), diffusion scholars have noted that a person's decision to adopt an innovation is not an immediate act; rather, it is a *process* that consists of a sequence of choices and events over a period of time in which an individual examines a new idea and chooses whether to integrate the innovation into his or her existing practice (Rogers, 2003). The innovation-decision process is defined by five stages that include (a) the knowledge stage, (b) the persuasion stage, (c) the decision stage, (d) the implementation stage, and (e) the confirmation stage (Rogers, 2003).

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Knowledge is the first stage of the innovation-decision process and is categorized into three types: (a) awareness knowledge, (b) how-to knowledge, and (c) principles knowledge (Rogers, 2003). Awareness knowledge pertains to an individual's cognizance of the innovation's existence and may motivate a person to pursue the other two types of knowledge (Rogers, 2003). How-to knowledge is the understanding required to use an innovation properly; it is linked strongly to the perceptions of complexity associated with an innovation (Rogers, 2003). Finally, principles knowledge includes the foundational aspects or technical principles undergirding the workings of an innovation (Rogers, 2003).

An individual's information-seeking behaviors are crucial during the persuasion stage, because he or she is forming perceptions of the innovation leading to its adoption or rejection (Rogers, 2003). The persuasion stage is a period of uncertainty that causes individuals to seek confirmation of their thinking and to form either a favorable or unfavorable attitude toward the innovation (Rogers, 2003). An innovation's perceived attributes play a key role during the persuasion stage, especially as they relate to relative advantage, compatibility, complexity, observability, and trialability (Rogers, 2003). Rogers (2003) maintained that these five attributes explained roughly one-half or more of the variance in rate of adoption for most innovations. Therefore, understanding agriculture teachers' perceptions of the attributes of IWBs should assist change agents in impacting the innovation's rate of adoption.

The decision stage occurs next and is when the individual decides to adopt or reject an innovation (Rogers, 2003). A major attribute linked to the decision stage is trialability. Often, individuals are able to make an adoption decision by trying the innovation as long as an acceptable level of relative advantage is perceived to exist.

The next stage is implementation, which is when an individual has begun to use an innovation (Rogers, 2003). Change agents must provide technical support as the client starts to use the innovation (Rogers, 2003). Depending on the innovation, the length of its implementation stage may linger or it may quickly become a regular part of the adopter's operations or routine behaviors (Rogers, 2003). This point may mark the end of the innovation-decision process for some individuals, while others may continue to the confirmation stage.

During the confirmation stage, an adopter "seeks reinforcement for the innovation-decision already made" (Rogers, 2003, p. 189). It is important for change agents to realize a decision reversal is possible during the confirmation stage. Reversal happens, typically, when conflicting messages are received by the adopter (Rogers, 2003). In this stage, adopters are searching for evidence that they made the correct decision and seeking a reduction in their level of dissonance regarding the adoption decision (Rogers, 2003). Developing a better understanding of where teachers are in the innovation-decision process may be helpful for designing effective strategies to encourage their adoption of the IWB.

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Using technology, including IWBs, in the classroom is not an entirely new phenomenon; however, "much more needs to be done to encourage and support agriscience teachers in the integration of technology in the teaching/learning process" (Kotrlik et al., 2003, p. 88). Therefore, this study sought (a) to understand the degree to which teachers had adopted IWBs, (b) to identify where teachers were in the innovation-decision process, and (c) to describe their innovativeness regarding the use of educational technologies.

Purpose and Objectives

The purpose of this descriptive-correlational study was to assess the perceived levels of innovativeness of secondary agricultural education teachers regarding their use of the IWB. The study also sought to determine if relationships existed between teachers' IWB innovativeness scores and selected personal and professional characteristics. Three research objectives guided this study:

1. Describe the agricultural education teachers' perceived levels of innovativeness regarding their use of IWBs;

2. Describe relationships between the agricultural education teachers' perceived levels of innovativeness and their selected personal and professional characteristics; and

3. Describe agricultural education teachers' perceived levels of innovativeness regarding the integration of technology in their classrooms.

Methods

Population and Sample

This study was part of a larger descriptive-correlational investigation (Bunch et al., 2012). As reported in the larger study (Bunch et al., 2012), the target population consisted of the secondary agricultural education teachers in Oklahoma (N = 437). The sampling frame used for this study was a list of the electronic mail addresses of all Oklahoma agricultural education teachers, as provided by the Oklahoma Department of Career and Technology Education. A random sample of 205 agricultural education teachers was selected using Krejcie's and Morgan's (1970) required sample size table. To address frame error (e.g., teacher relocation or individuals no longer in the profession), 18 teachers were removed from the study. In addition, another 18 teachers had incorrect or otherwise unreliable e-mail addresses, and they were also removed from the study. As a result of frame error, the original sample of 205 teachers was adjusted to an accessible sample of 169 teachers. Completed questionnaires were received from 81 of the 169 teachers for a 48% response rate.

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An overwhelming majority of the teachers were male, held only a bachelor's degree, and were traditionally certified. This was consistent with the teacher population of Oklahoma (K. Murray, personal communication, September 22, 2010). In addition, a majority of the teachers in this study had taught from 0 to 5 years. For the purpose of interpreting the study's results, it was assumed the teachers who reported 0 years of teaching experience based their perceptions on student teaching experiences with IWBs, as well as experiences that occurred during their initial year of teaching.

Instrumentation

The Interpersonal Technology Integration Scale (ITIS), as developed by Niederhauser and Perkmen (2008), was used in the larger study (Bunch et al., 2012). The original 21-item ITIS asked the teachers to indicate their levels of agreement with each statement using a 5-point, summated-rating scale. The ITIS includes three constructs: (a) Self-Efficacy, (b) Outcome Expectation, and (c) Interest. However, these constructs were not included in the analyses reported here. Rather, this study focused on the 18 professional and personal characteristics questions added to the instrument to describe the sample and make possible the study's correlational analyses.

As a part of the professional and personal characteristics section, two items were added to measure teachers' levels of innovativeness regarding the use of IWBs and their levels of innovativeness for integrating technology in their classrooms in general. The items were modified from a study conducted by Li and Lindner (2007) that assessed the perceptions of Chinese university faculty on the use of Web-based distance education. These statements included:

- "I know as a teacher, technology use is limited in my classroom. Using an IWB may be a solution to this problem."
- "I know as a teacher, technology use is limited in my classroom. Using an IWB is a good solution to this problem."
- "I know as a teacher, technology use is limited in my classroom. I know the benefits of using IWBs, and will try it in my own teaching soon."
- "I am currently using an IWB, and it helps me to increase technology use in my classroom."
- "I have used an IWB for more than 1 year, and plan to continue using it."

Each statement aligned with stages in Rogers's (2003) innovation-decision process. In addition, respondents were asked to indicate on a scale of 1 (*least innovative*) to 5 (*highly innovative*), "How would you rank your innovativeness regarding the integration of technology into your classroom?"

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A panel of four experts in agricultural education reviewed the instrument to establish its content and face validity. Based on the recommendations of the panel, minor revisions were made to the instrument. The instrument was also pilot-tested with 36 Oklahoma agricultural education teachers to ensure its readability and clarity. The teachers who participated in the pilot test were excluded from the study reported on here.

Data Collection

Data were collected through an Internet questionnaire using the Tailored Design Method, as developed by Dillman, Smyth, and Christian (2008). All teachers were contacted via an e-mail message describing the purpose of the study and including a link to the questionnaire. At the conclusion of weeks 1, 2, and 3, reminder messages were sent to the nonrespondents. To ensure the results were representative of the target population, an independent samples *t*-test was used to compare early and late respondents (Lindner, Murphy, & Briers, 2001) based on perceived level of innovativeness regarding use of IWBs and perceived level of innovativeness regarding the integration of technology in the classroom. No statistically significant differences were found at an alpha level of .05; therefore, the results of this study were deemed representative of the target population.

Data Analysis

The data collected were analyzed using SPSS® version 17.0 for Windows™. Responses were coded for computer analysis. Research objectives 1 and 3 were analyzed using descriptive statistics—specifically, frequencies and percentages. Research objective 2 was achieved by computing Spearman rank order correlation coefficients, because the variables of interest were not interval data (Creswell, 2008). The strength of relationships was described using Davis's (1971) conventions: $.01 \geq r \geq .09$ = *Negligible*; $.10 \geq r \geq .29$ = *Low*; $.30 \geq r \geq .49$ = *Moderate*; $.50 \geq r \geq .69$ = *Substantial*; and $r \geq .70$ = *Very Strong*.

Limitations of the Study

This study sought to describe how agriculture teachers used IWBs, levels of teacher innovativeness in regard to ITs, and selected relationships. As mentioned previously, no statistically significant differences were found between early and late respondents (Lindner et al., 2001) regarding the variables of interest. However, the 81 respondents represented only 17.7% of the target population, and the majority of the respondents reported having 5 or fewer years of teaching experience. It is possible that different results may have been found if a larger number of the respondents had more years of teaching experience. Further, limitations to the instrument used existed; specifically, the item used to measure teachers' attitudes toward IWBs did not include an option for *decision reversal* or a *no knowledge* option. According to Rogers (2003),

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decision reversal can occur during the confirmation stage of the innovation-decision process. It also should be noted that this item did not undergo test–retest reliability analysis. As such, readers are cautioned against generalizing the results of this study beyond its 81 respondents.

Results

Objective 1 sought to describe the teachers' levels of innovativeness regarding their use of IWBs. To achieve this objective, the researchers had respondents select the one statement that described best their attitude toward IWBs. Eleven (13.6%) of the respondents indicated technology use was limited in their classroom and using an IWB may be a solution to this problem (knowledge) (see Table 1). Seven (8.6%) reported that technology use was limited in their classroom and using an IWB was a good solution to this problem (persuasion), and seven (8.6%) perceived that technology use was limited in their classroom, knew the benefits of using an IWB, and would try it in their own teaching soon (decision). In addition, 29 teachers (35.8%) expressed that they were using an IWB currently, and it helped them to increase technology use in their classrooms (implementation), and 25 (30.9%) of the respondents indicated they had used an IWB for more than 1 year and planned to continue using it (confirmation). Two (2.5%) participants did not respond to this item (see Table 1).

Table 1. Agricultural Education Teachers' Perceived Levels of Innovativeness Regarding Their Use of IWBs (n = 81)

Rogers's (2003) Stages of the Innovation-Decision Process	***f***	***%***
Knowledge	11	13.6
Persuasion	7	8.6
Decision	7	8.6
Implementation	29	35.8
Confirmation	25	30.9
No Response	2	2.5

Objective 2 sought to describe relationships between teachers' levels of innovativeness and selected personal and professional characteristics. The relationship between teachers' levels of innovativeness and access to IWBs was very strong and positive (r_s = .70); it had the highest correlation coefficient of the associations measured (see Table 2). The variables "IWB use per week" (r_s = .62) and "using the IWB increases how much students learn in my class" (r_s = .55) demonstrated a substantial and positive relationship with teachers' levels of innovativeness. The variable "how frequently a respondent uses information technology (IT) personnel to support their use of IWBs" (r_s = .41) was found to have a moderate and positive association with teachers' levels of innovativeness. The analyses also revealed the variables "if training was received" (r_s = .28), "problems encountered while using IWBs" (r_s = .26), and "access to IT personnel" (r_s = .24) expressed low and positive relationships with teachers' levels of

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innovativeness. Teachers' ages (r_s = -.39) and years teaching (r_s = -.36) had inverse (i.e., negative and moderate relationships with their levels of innovativeness (see Table 2).

Table 2. Relationships Between Agricultural Education Teachers' Perceived Levels of Innovativeness and Selected Personal and Professional Characteristics (n = 81)

Variables	**Levels of Innovativeness**
Access to IWBs	.70*
IWB use per week	.62*
Using the IWB increases how much students learn in my class	.55*
Frequent use of IT personnel	.41*
Where training was received	.28*
Problems encountered while using IWBs	.26*
Access to IT personnel	.24*
Age	-.39*
Years of teaching experience	-.36*

Note: Spearman rank order correlation coefficient: *p < .05

Objective 3 sought to describe Oklahoma agricultural education teachers' levels of innovativeness regarding the integration of technology in their classrooms. The descriptive analyses revealed that the composite mean of the sample was 3.16 with a standard deviation of 1.0, indicating the respondents had an average level of innovativeness regarding the integration of technology into their classrooms. Four (4.9%) of the respondents reported a score of 1, seven (8.6%) reported a score of 2, 43 (53.1%) reported a score of 3, 22 (27.2%) reported a score of 4, and five (6.2%) reported a score of 5.

Conclusions and Implications

This study revealed that a majority of the teachers surveyed indicated they were using IWBs. Further, these teachers perceived IWBs assisted them in increasing technology use in their classrooms, and they planned to continue using IWBs. It was concluded that these teachers were in the implementation and confirmation stages of the innovation-decision process (Rogers, 2003). A majority of teachers involved in this study had adopted the IWB, used it in their teaching practice, and were seeking confirmation that they had made the correct decision. On the other hand, because not all teachers had adopted IWBs, this finding also supports Rogers's (2003) assertion that not all individuals adopt innovations at the same rate. What is more, in Oklahoma, agriculture teachers have the opportunity to apply for a $5,000 technology grant each year through the Oklahoma Department of Career and Technology Education. As a result, many teachers who were awarded grants had purchased IWBs (K. Murray, personal communication, September 22, 2010). The grant could be considered an incentive to adopting IWBs. According to Rogers (2003), incentives increase the perceived relative advantage of an innovation and encourage behavioral change, thus increasing the rate of adoption.

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In addition, teachers who perceived the use of IWBs increased how much their students learned were advanced farther in the innovation-decision process. This finding was consistent with Rogers's (2003) theory in regard to relative advantage (i.e., the more an individual perceives an innovation to be better than what it superseded, the more likely he or she is to adopt the new innovation). Therefore, if a teacher perceived that using the IWB would increase student achievement, the teacher may have been more likely to adopt it.

Further, as a teacher's age and years of teaching experience increased, his or her perceived level of innovativeness regarding the use of IWBs decreased. Younger and less experienced teachers, therefore, were more advanced in Rogers's (2003) innovation-decision process. Were the older, veteran teachers digital immigrants who lacked technological confidence (Prensky, 2001)? If so, this may have added to their perceptions of *complexity* regarding the use of IWBs. According to Rogers (2003), if an individual perceives an innovation to be complex, the rate of adoption is affected negatively. In addition, teachers with access to IWBs who used the IWBs more per week were in the later stages of the innovation-decision process. This finding also resonates with Rogers (2003), who maintained that when an individual has the opportunity to try an innovation (i.e., the attribute of *trialability),* perceptions of uncertainty may be diminished, which is related positively to increasing an innovation's rate of adoption.

Finally, this study revealed that more than three-fourths of the responding teachers reported their levels of innovativeness regarding the integration of technology in their classrooms as *average* to *highly innovative*. This may imply these teachers had completed the knowledge and persuasion stages of the innovation-decision process, as described by Rogers (2003). Further, they were aware of other educational technologies and planned to implement them in their classrooms. Given that more than 75% of the respondents reported an *average* to *highly innovative* score (see Table 1), it was concluded these teachers were *earlier adopters* of IWBs (i.e., they populated the early majority, early adopter, and innovator categories) (Rogers, 2003). According to Rogers (2003), however, earlier adopters usually make up only about 50% of the population in most social systems. Again, the role of incentives may account for this contradiction to Rogers's (2003) posit, and the influence of incentives may warrant further study as well as consideration by policymakers.

Recommendations for Practice

As an *older* generation of instructors, who are considered digital immigrants (Prensky, 2001), encounter the barriers associated with a *digitally programmed* generation of students, they should reexamine their methods of instruction and identify teaching practices more relevant to today's pupils (McAlister, 2009). In fact, according to Prensky (2001), students of the digital generations perceive the educational system has taken in *outsiders* to teach them.

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Brown (2000) opined that this phenomenon is the result of a shift in learning. Further, Prensky (2005) attributed this shift from the *old* to the *new* differences in learning media. Digital media, communication, and limitless amounts of information via the Internet have captivated today's students. As such, digital generations have also transitioned from expecting (or even *accepting*) a teacher-centric instructional style to *demanding* a more student-centric style or approach (Brown, 2000). Because the teachers in this study perceived using the IWB increased how much their students learned, the instructional tool held *relative advantage* (Rogers, 2003). Professional development opportunities, therefore, should be created for in-service teachers to learn how to use IWBs effectively to assist in increasing student achievement. In addition, the professional development workshops should focus on using interactive educational technologies, including IWBs, in student-centric ways (Cakir, 2008; Glover & Miller, 2001; Mayer, 2004; Minner et al., 2010).

Approximately one-fourth of the teachers studied populated the knowledge and persuasion stages of the innovation-decision process (Rogers, 2003) regarding the adoption of IWBs. Is it possible that these teachers did not perceive the relative advantage of IWBs, viewed them as too complex, or had not experienced opportunities to try using them in the classroom? According to Rogers (2003), the attribute of *complexity* decreases the likelihood that an innovation will be adopted. And if teachers lacked experience with using or *trying* the IWBs, the need for more *observability* and *trialability* may have existed (Rogers, 2003). It is recommended, therefore, that in-service workshops and related professional development offerings for these teachers include topics demonstrating (*observability*) the effective use of IWBs and provide opportunities for practice (*trialability*) with this instructional tool.

Further, in regard to the study's theoretical framework, Rogers (2003) asserted that individuals who are in the persuasion stage are formulating attitudes toward the innovation. These individuals develop attitudes through their communication with near peers (Rogers, 2003). To that end, the professional development offerings should facilitate communication between teachers and their peers (Guzey & Roehrig, 2012) regarding the use of IWBs. The opportunities to communicate with near peers may increase the likelihood of teachers' transitioning from the persuasion stage to the decision stage (Rogers, 2003) and deciding to adopt the use of IWBs as part of their teaching practice.

Recommendations for Additional Research

Because more than three-fourths of the respondents indicated an innovation score of average and above regarding the integration of technology in their classrooms, future research should be conducted to determine which interactive technologies teachers may be using other than IWBs. This inquiry could provide insight on these teachers' in-service needs regarding their use of educational technologies, such as wireless slates, iPads, and digital game-based learning tools, to

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name a few. Further, because teachers perceived that using the IWB increased how much their students learned, inquiries should be conducted to determine how the use of IWBs affects student learning and achievement in agricultural education. For instance, do students who receive lessons taught using IWBs perform better on end-of-instruction tests than those who do not? What is the impact of the use of ITs on students' critical thinking skills? Is the "decay," or lack of learning retention over time, reduced if ITs are used during students' learning experiences? Finally, experimental studies should be used to investigate this phenomenon with the aim of generalizing the results to similar populations.

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