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An Instructional Video Module on Spreadsheets Accommodating the Needs of Senior Citizens

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October 1, 2009

## Introduction

Computer literacy is essential for success in the 21<sup>st</sup> century. These skills are often used to accomplish academic, career, and personal tasks more effectively and efficiently as compared to completing them in traditional manners (Bean & Laven, 2003). Digital immigrants, classified as those who were born before 1980, did not grow up with technology assisting everyday duties, as much of today's younger generation, or the digital natives, have been able to experience (Prensky, 2001). Therefore, as the older generation of adults makes attempts to become a part of the technologically-savvy generation, many find it a challenge to succeed. Common reasons include the heavy time and effort demands required to learn the innovation, in addition to their decline in functions and abilities, and inaccessibility to equipment and resources (Selwyn, Gorard, & Furlong, 2003).

Society has the responsibility to provide appropriate pedagogical tools to teach digital immigrants how to be functional, rhetorical, and critical users of technology (Selber, 2004). Without providing accessible education geared towards older adults, this generation is not given fair opportunity to utilize, enjoy, and maximize the wonders of technology. Research shows that successful computer training sessions that produce proficient learners, help to support the confidence of computer users; therefore, computer classes for older adults are on the rise (Mayhorn, Stronge, McLaughlin, & Rogers, 2004). Additionally, as the number of older adult users increase, computers are becoming more accessible: community and day centers, coffee shops, shopping centers, stores, nursing homes, libraries, relatives' homes, and even purchasing of personal devices (Selwyn et al., 2003).

In the process of teaching computer skills to senior citizens, there are specific needs that must be satisfied. These older learners are often provided with handouts composed of step-by-

step instructions to complete tasks, as they have difficulty interpreting and applying instruction that is solely verbalized. However, there are many additional accommodations that must be considered for older adults in order to promote successful learning of new skills and tasks (Segrist, 2004).

The question to be examined in this study is, “Is an instructional video module an effective means through which to transfer step-by-step instructions for completing a computer task to senior citizen computer users while accommodating their needs?” Previous research has been conducted to determine the effectiveness of instructional videos on learning in general, but there is limited literature about the effects of using videos that incorporate specific instructional strategies for teaching senior citizens computer tasks.

Individuals who are 55-years of age and older will be constituted as “senior citizens” or “older adults” for the purpose of this research study. An instructional video module featuring an introductory spreadsheet lesson will be recorded using iShowU, a screen capture and recording software. The video module will consist of fluid on-screen action recordings supported by synchronized audio narration, while integrating specific accommodations for older adults. The learners will also be able to control the pace of the material to meet their individual needs. Due to the capability of video to transfer information through various modes, this instructional tool has the potential to make learning experiences for older adults more effective and efficient (Lin & Hsieh, 2006).

## Literature Review

### *Senior Citizens’ Attitudes Toward Computers*

Mayhorn et al. (2004) summarized, “Factors such as previous computer experience, computer anxiety, and perceived usefulness may interact to influence the development of older

adults' attitudes towards computers" (p. 192). With the rapid increase of technology that make everyday tasks more efficient, effective, and convenient, there are a growing number of digital immigrants who find it necessary and have the desire to learn computer skills (Selwyn et al., 2003). Common reasons for having the motivation to learn computers include, "enhancing communication, searching for information, remaining active, and learning for pleasure" (Mayhorn et al., 2004, p. 190). This implies that the older generation strives to maintain independence, and places importance on remaining active members of society. Research shows that senior citizens who become proficient users of computers tend to possess fewer depressive symptoms than older adults who are not technologically capable (Cisek, 2005). As mentioned by Shapira, Barak, and Gal (2007), "Computers can empower older people, contribute to their quality of life, and help in coping with this group's typical mental and physical difficulties" (p. 477).

It is common for older adults to seek their own children, grandchildren, or even computer classes for assistance in learning how to use computers. However, many of these computer literate resources ignore the specific needs of older adult computer users. As a result, they quickly zip through the process, leaving the computer learners feeling overwhelmed, confused, and incapable (Selwyn et al., 2003). Furthermore, older adults tend to be more hesitant than younger users to take risks and explore the computer applications in fear of breaking the machine or making errors (Bean & Laven, 2003).

Consequently, digital immigrants are often reluctant to learn about and to use computers, as it encompasses a whole new set of knowledge, skills, and habits that take time to understand and to become comfortable with (Selwyn et al., 2003). Senior citizens require specific accommodations for successful computer training that meets their special needs. After all,

research shows that effective computer instruction that leads to proficient computer use can build up the confidence of older adult users (Bean & Laven, 2003). Segrist (2004) expressed that, “Older adults’ computer attitudes are modifiable and that direct, customized, computer training is an effective catalyst for change” (p. 568).

### *Considerations for Designing Instruction for Senior Citizens*

Changes in perceptual senses, motor functions, and cognitive capabilities that develop with age affect the self-efficacy and attitudes of older adults towards computers usage (Mayhorn et al., 2004). These changes can be attributed to a number of factors: the decline of senses, stress, fatigue, illnesses, side effects of medicines, and others (U.S. Department of Health and Human Services, n.d.).

Reduced visual acuity leads to difficulty in seeing smaller objects and focusing in on objects on the computer screen. Accommodations for these problems include providing larger text and images for older computer users, and perhaps using multi-focal lenses (Selwyn et al., 2003). It is also common for senior citizens to have sensitivity to glare on the computer screen, which can be reduced by moving the computer to an area where light is not directly reflecting off the screen or using a screen cover. In addition, to support decreased sense of hearing, audio must be clear, slowed, and have adjustable volumes (Mayhorn et al., 2004).

Decline in motor functions is another issue that must be considered when designing instruction for older adults. In a number of studies, it was revealed that older adults had common challenges in pointing and clicking on objects, clicking and dragging objects, and single or double clicking (Mayhorn et al., 2004). Accommodations for these deficits include adjusting the settings for mouse clicks, using keyboard shortcuts, and using device alternatives, such as touch pads, touch screens, and roll balls. Moreover, participating regularly in computer activities that

allow for practice in controlling the mouse can improve such motor skills (Mayhorn et al., 2004).

Cognitive changes, such as processing speeds, attentiveness, and retention, are also linked to aging (Mayhorn et al., 2004). As a result, specific best practices should be considered when communicating and transferring information to older adults. The material to be taught at any one time must be critically selected to avoid content-overload and overwhelm. The sub-concepts should be broken-up into chunks to effectively facilitate the transfer of the information. To support understanding, it is important that clear, concise, and simple language is used (U.S. Department of Health and Human Services, n.d.). Connecting computer terms to more commonly known terms also allows for easier understanding (Bean & Laven, 2003). For example, when introducing “icons,” they can first be identified as “pictures,” which is a more familiar term that the learners can associate the new vocabulary with. To support retention, important details and objectives should be repeated and emphasized. In addition, providing older adults with adequate time for information processing and application is essential (U.S. Department of Health and Human Services, n.d.). Frequent review and practice is imperative to reinforce the content and to assist in memory functions in order to encourage “. . . new skills to become automatic” (Bean & Laven, 2003, p. 5).

#### *How Senior Citizens Learn Procedural Tasks*

Aside from the specific considerations as mentioned above, senior citizens benefit from the combination of visual and audio instruction in learning procedural tasks (Lin & Hsieh, 2006). Wright and Belt (2001) expressed, “Adding graphics showing the actions to be performed might compensate for language impairments [of older adults], especially if the graphics are animated and synchronized with verbal instructions” (p. 60). This quote underscores the idea that visual aids that show the sequence of movements and simultaneous support of verbal narration can

greatly support understanding.

A study conducted by Wright and Belt (2001) revealed that the senior citizens were faster in completing a procedural task and used the “help” feature less often when the instructions consisted of both animation and language, as compared to having only one or the other. However, the authors mentioned, “Procedural tasks making fewer demands on visuo-spatial ability might not show the advantage of combining animation and language” (Wright & Belt, 2001, p. 61). In other words, successive visual instructions supported by spoken or written instruction has proven to be beneficial to older adults while performing tasks that rely heavily on sight and space, but not necessarily for tasks that rely less on these elements.

Much literature also emphasized that older adults benefit from instruction that is transferred visually and supported by audio narration, especially for complex tasks, which are categorized as those in which the learners must remember a number of connections between the procedures. Lin and Hsieh (2006) described, “Animation enables these dynamical relationships to be coherently displayed and facilitates effective chunking of the procedural knowledge as a result, particularly when the task involved consists of a large number of procedures” (p. 74). On the other hand, static pictures are not as effective in guiding learners to develop an accurate mental image of sequential steps, and the operation of the approach. Static visuals with textual descriptions tend to be more adequate for teaching older adults simpler tasks (Lin & Hsieh, 2006).

Nevertheless, McLaughlin, Rogers, and Fisk (2002) pointed out that many previous studies show inconsistent results regarding comparisons between the effectiveness of the combination of video and audio-based instruction, as opposed to these elements independently. These authors argued that this is probably true because much research fails to focus on the delivery of

instruction regarding a specific type of learning goal.

### *Instructional Videos and Learning*

Lin and Hsieh (2006) stated that, “. . . multimedia has become a mainstream information platform adopted in most computer-aided training systems” (p. 2). In today’s age, instruction that is transferred through computers is often presented using this means of information transfer. The technology allows for differentiation as information can be transferred visually, audibly, and even kinesthetically to meet the needs of unique learners and specific desired outcomes. Multimedia can be especially beneficial to English language learners and students with disabilities or special needs (Cisco Systems, Inc., 2008).

Additionally, Aragon and Zibrowski (2008) found that instructional videos were beneficial in allowing students to view fine details of procedures. Many times in live-instructor demonstrations, students need to be divided into groups to view the instruction from a decent distance. However, it is still difficult for students to view the intricate details of the steps in this way. Students often have to take turns viewing close-ups of the procedures during live demonstrations, and thus, it is not possible for each of them to view the entire procedure adequately. With instructional videos, all learners can view the demonstration from an up-close perspective. This is also ideal for students with visual disabilities as images and text can be enlarged on a computer screen (Lam, 2005).

Nevertheless, if students are put into groups to ensure that each individual is able to view the demonstration from a decent distance, the instructor must repeat the process over again to each group. With instructional videos, the demonstration is required to be conducted and recorded once, and can be distributed to a number of people on a number of occasions. As a result, time is saved for both the instructor and students (Aragon & Zibrowski, 2008). The

videos also allow the students to be independent learners as they can often access these applications when and where it is convenient for them, granted that the exercises are posted online or shared in another manner. This gives the students control to go through the process at their own pace with the option of repeating the activity. Ultimately, instructional videos support both teaching and learning as instructors do not have to repeat themselves, and students can learn in a way that meets their needs (Lam, 2005).

Videos also allow for fluid movements of the progressive steps to be demonstrated. On paper-based handouts, step-by-step instructions are usually typed out with screen captures of the significant steps to provide supplementary assistance. Although the textual instructions may explain exactly to how to get from one step to the next, those who are visual learners are at a disadvantage because they will not be able to see the fluid actions between each step. Dynamic graphics through instructional videos enable recordings of actual demonstrations to be presented; therefore, students can see the exact actions that were taken to perform a task (Hartmann, 2006). “The animations provide opportunities for students to take greater control of their learning. They can be played step-by-step and they can be replayed until they are fully understood. Interactive models are used to help make abstract concepts more tangible” (Bradley & Boyle, 2004, Pedagogical Design section, ¶2).

### *Issues with Learning through Instructional Videos*

In today’s age, the use of computer animations and videos are popular due to their incredible capabilities and their tendency to cut down on costs (Surprise & Mitchell, 1994). However, these innovations cannot simply be integrated within instruction and expect to produce optimal learning results. Hartmann (2006) expressed, “One of the most important subclass of instructional design decisions is the choice of the right format for information delivery” (p. 1).

There are many resources and tools that can be used to enhance and optimize learning experiences, but the instructional strategy should be purposeful and appropriate based on the content, the learners, the environment, and the learning objectives.

Combining media elements, such as in video instruction, does not automatically promote effective learning. As Beaudin and Quick (1996) stated, “The video should stimulate, motivate and inform the learner to act on the information” (Content section, ¶2). The design of the instruction is a very critical aspect of the effectiveness of the videos. First of all, the content must be accurate, unbiased, and useful for the intended audience. The main part of the strategy should present the instruction logically. As with any other instructional method, when using videos, breaking up general instructional objectives (GIOs) into smaller video learning objectives (VLOs) can aid in the learning process (Lam, 2005). Lam (2005) expressed, “These smaller VLOs will enable students to perform a task or certain sets of tasks leading to the GIOs” (p. 2). Tackling small learning tasks that build up to the main objective allows students to digest manageable chunks of information at a time. The conclusion of the instruction should provide learners with review or practice to encourage retention and application of the material.

The evaluation step covers how the product or instructional method will be assessed and evaluated. As for the technical aspects of the videos, they should allow interaction between the learners and the content, and present the material in engaging manners that clarify the ideas through audio and visual components. Supporting materials should also be provided if necessary to ensure that the learners are aware of essential background knowledge and/or vocabulary to understand the content (Beaudin & Quick, 1996).

Nevertheless, showing a video that is solely a recording of a lecturer talking is not an optimal application of this technological tool. Interactivity is an essential component of effective

video integration. According to Zhang, Zhou, Briggs, and Nunamaker (2006), interactivity is defined as “the use of computer systems to allow proactive and random access to video content based on queries or search targets” (p. 17). This includes providing control buttons for the learners to manage the pace of the instruction. Surprise and Mitchell (1994) suggested that “Interactive video instruction is particularly effective for training motor skills, procedures or processes” (p. 531) due to videos’ capability of providing learners with simulations and tactile experiences, which offer hands-on learning opportunities. These types of experiences allow learners to be active learners who “do” rather than passive learners who simply “watch.”

In a study by Zhang et al. (2006), results indicated that there were no significant learning differences between students who learned a concept through videos with no interaction, and students who did not learn through any type of video. Meanwhile, those who learned through interactive videos showed the most improvement in their learning. These results proved that instructional videos are most effective when they allow opportunities for interaction.

### *Principles of Multimedia Design*

When developing multimedia, such as instructional videos, research indicates that positive results are more likely to arise when cognitive considerations are linked to the design, in addition to specific considerations geared towards the target audience (Clark, 2002). Clark (n.d.) reiterated that “psychological processes you need to support include: attention, management of load in working memory, rehearsal of new information in working memory that results in encoding in long-term memory, and retrieval of new skills back into working memory when needed” (p. 4). These processes can be satisfied by considering principles of multimedia design, which were concluded from numerous research conducted by Richard Mayer and his colleagues (Clark, 2002):

The Multimedia Principle focuses on the idea that learning is most effective by means of the combination of pictures and words. Through a number of studies, Mayer found an 89% improvement rate in learning when relevant visuals supported text (Clark, n.d.).

The Spatial Contiguity Principle emphasizes that students learn best when related pictures and words are shown near to each other rather than spread out on the screen. This also relates to the Temporal Contiguity Principle, which stresses that learning is even more successful when related words and pictures are shown simultaneously rather than one after another.

The Coherence Principle emphasizes that only necessary words, pictures, and sounds should be included. Media should not be integrated solely for its bells and whistles. There must be a purpose for each element, otherwise, the extra media may cause distractions and cognitive overload.

The Modality Principle illustrates that students learn most effectively when information is taken in through two different perceptive channels, rather than two visual means. For example, dynamic or animated graphics combined with audio narration is more effective as compared to dynamic representations combined with accompanying text.

Moreover, the Redundancy Principle states that repetitiveness of information should be avoided. The more means through which information is transferred simultaneously does not necessarily lead to enhanced learning. It is actually difficult for learners to grasp the ideas represented by visuals, while trying to synchronize the text to the audio narration. Again, the extra media may cause distraction and cognitive overload.

Finally, the Individual Differences Principle stresses that the design elements have a more powerful effect for low-knowledge learners and for visual learners, rather than for high-knowledge learners and for less visual learners.

*Relevance to a Master's Project*

This instructional design project integrating a video module geared towards digital immigrants, specifically senior citizens, 55-years and older, will be designed, developed, executed, and evaluated. The purpose of this study is to determine the effects that this mode of instruction has on the learning and understanding of older adults.

Due to the decline in visual, motor, and cognitive functions that develop with age, it can be a challenge for seniors to understand and apply instructions. Instructional videos that consist of actual on-screen recordings of computer tasks may be helpful for such learners; they can see step-by-step what to do, what icons look like, and where certain objects are located on their screen, with the support of audio narration. After all, much of the literature emphasizes that for complex tasks, dynamic representations are most effective in fostering understanding in a way that allow senior citizens to comprehend and apply the steps accordingly.

The “ADDIE” model (Gagne, Wager, Golas, & Keller, 2005), which is a systematic model of design, will be used as a guide to ensure optimal creation of the learning event. This process includes five phases: analysis, design, development, implementation, and evaluation. Furthermore, the instruction will include Gagne’s Nine Events of Instruction (Gagne et al., 2005), which cover nine processes that must be activated in order for effective learning to take place.

### Conclusion

The desire and need to use computers is growing amongst digital immigrants. Providing opportunities for these older adults to learn technology is essential. In the same way that digital natives use technology to simplify everyday tasks, the older generation should have access to training that will provide them with the same knowledge and skills. Senior citizens, like any other demographic, need to be given fair opportunities to reap the benefits of technology.

Designers must be aware that older adults learn differently as opposed to the way younger adults learn due to factors that develop with age; consequently, specific considerations in designing instruction must be incorporated. Instructional videos allow for visual and audio elements to be combined, which can compensate for the deficits of older adults, and offer added support to their understanding of tasks that involve sequential steps.

As with the execution of all instructional strategies, video must satisfy the best practices of instruction. If the guidelines for effective video design and special instructional accommodations for older adults are considered and implemented, learning for this demographic of individuals can be enhanced. However, there is currently insufficient literature that focuses on the effects of using instructional videos to teach senior citizens procedural computer tasks; therefore, this instructional design project will strive to establish general conclusions about the effectiveness of an instructional video module in teaching senior citizens step-by-step directions for creating a simple table and chart using spreadsheets. Nevertheless, researchers must conduct further studies to examine specific factors related to older adults and their learning in order to design and develop optimal learning resources.

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