

A COMPARISON OF TRADITIONAL AND SELF-PACED INSTRUCTION: KNOWLEDGE GAINED IN A FOOD SAFETY CERTIFICATION COURSE

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Abstract

The prevention of foodborne illness in childcare centers is a major public health concern. One prevention mechanism is the education of childcare providers. Because of the very diverse population in the childcare profession, the constant turnover rate and the need for high-quality, accessible training, providing this training proves to be an ongoing challenge for many state Extension programs. TummySafe[®] met this challenge by offering food safety training via two methods. Participants either attended a traditional Extension workshop or experienced the curriculum on a computer of their choosing via CD-ROM. The Mississippi State University Extension Service's 82 county offices coordinated training for childcare providers from April 2005 to June 2006. Traditional participants (n = 829) had higher posttest score means, after adjusting for pretest knowledge, than participants in the self-paced group (n = 796). An ANCOVA revealed a statistically significant difference ($F = 268.00$, $p < .05$) favoring the traditional delivery method. Nonetheless, the participants of the self-paced group were highly satisfied with the training and the convenience it offered.

Introduction

Most state Extension services have initiatives and programs for which the main goal is to improve public health through education. Educating childcare providers is one way of helping to improve public health by preventing foodborne illness. However, constant turnover rates and time restrictions make it difficult to keep up with the educational needs of this diverse Extension clientele group. To solve this ongoing problem, the Mississippi State University Extension Service (MSU-ES) and the Mississippi State University (MSU) School of Human Sciences developed an interactive multimedia training resource (called TummySafe[®]) that could be completed at the convenience of childcare providers.

When using a new training methodology, it is wise to question whether it is an effective mode of education for a given population. It is common to find studies that address Extension clientele likes and dislikes regarding a program. However, very few studies have been conducted with Extension clientele groups that measure

knowledge gained while comparing two educational methodologies.

Theoretical Framework

Distance education is commonly defined as a learning activity that occurs when students and instructors are separated by geographical distance and/or by time and is often supported by technology (Indiana Partnership, 1999). The advancement of information technology has allowed the instructor much flexibility in the learning environment. Because of these many changes, Bork (2000) indicated that educational providers are experiencing a shift from the information-transfer learning paradigm to the tutorial learning paradigm. One of the ways that the teaching and learning process is benefiting from this increased flexibility and resulting paradigm shift is in the realm of self-paced learning.

Self-Paced Learning

A large percentage of Extension clientele are adults. As such, they have a unique set of learning preferences. Knowles

(1973) acknowledged that adults are largely self-paced learners who prefer immediate application of experiential learning that is guided by real-life needs. Accordingly, it seems logical that computer-based self-paced learning is one method for reaching Extension adult clientele.

Self-paced learning has been studied extensively. Kenny (2007) found self-paced training to be an effective method of teaching adults on the topic of child mistreatment, based on statistically significantly higher scores on posttests, compared with the pretest exam scores. In addition, those adult students reported that they enjoyed the self-paced nature of the course and found it to be an effective, convenient method for required training. Thompson, Jeffrey, Rodriguez, Shanley, and Courville (2007) compared the effectiveness of self-paced and traditional methods for teaching food safety to middle school students and found that the self-paced methodology was as effective as the traditional methodology. Sexton, Raven, and Newman (2003) found no statistical significance in knowledge gains when using a self-paced or traditional training methodology for adult Extension agents, but only when the learning content was at the lowest level of the cognitive domain.

Curriculum Design

According to Clark and Mayer (2003), to have successful self-directed learning, the curriculum designer must consider many factors. There are issues ranging from the selection of courseware, to successfully engaging the learner in cognitive thought processes, to final product dissemination. Oh and Lim (2005) found that most traditional, self-paced learning courses merely provided students with lecture notes, required readings and other topics of potential interest. This approach only serves to magnify the defects of online instruction such as learner isolation. In order for effective distance learning to occur, Oh and Lim concluded that a variety of learning content should be provided (such as audio, video, and interactive exercises) with well-guided instruction and scaffolding activities.

Cognitive Engagement

One may question whether self-paced learning is capable of provoking true cognitive engagement on part of the learner. According to Corno and Mandinach (1983), cognitive engagement is observable when the learners give sustained, engaged attention to a task requiring mental effort; and authentic, useful learning is produced by extended engagement in optimally complex cognitive activities. The highest form of cognitive engagement is self-regulated learning, in which learners plan and manage their own learning and have a high degree of personal control and autonomy (Corno & Mandinach). This form of self-regulated learning is one potential outcome of the TummySafe[®] program because it places the control over the learning environment firmly in the hands of the adult learner. Nonetheless, according to Newcomb, McCracken, and Warmbrod (1993), directed learning is more effective than undirected learning. Although curriculum designers can develop multimedia products for self-paced instruction that attempt to mimic the traditional classroom, the teacher is not physically present during the learning experience to supervise the learning activities of students (an important part of the teacher's responsibility according to Newcomb, et al).

The use of multimedia can foster and develop cognitive engagement through its ability to attract and hold students' attention and focus. The very attributes that provide the potential to develop cognitive engagement, however, are also those that hold strong prospects for limiting and impeding learning. Research into programs and applications that encourage self-regulation and learner control frequently report problems associated with learners' inability to successfully monitor and manage their learning and to remain engaged and focused on the learning tasks (Ormrod, 1995).

Purpose

The purpose of this study was to compare the effectiveness of a self-paced interactive course on CD-ROM with a traditional Extension workshop. The

following null hypothesis was tested in this study:

H₀: For childcare providers participating in the TummySafe[®] food safety certification program, there will be no difference in group means between childcare providers taught using the traditional method with a live instructor and childcare providers taught using the self-paced delivery method.

Methodology

Research Design

The study was conducted using a nonequivalent control group design (Campbell & Stanley, 1963). This quasi-experimental design is represented below (Trochim, 2006):

N	O	X	O

N	O		O

In this design without randomization, the internal validity threat of selection is of primary concern. Childcare center owners or directors often chose the method of delivery for all of the childcare providers at their childcare center. Thus, some childcare providers self-selected to be a part of the treatment group and others had that choice made for them. This treatment selection process should be considered when interpreting the results.

According to Campbell and Stanley (1963), a potential threat to external validity is the interaction of testing and treatment. In this design, a presumption is that the pretest may alert learners as to what is most important in the upcoming material, resulting in higher posttest scores. Because true randomization was not a possibility in this public education situation, the need for a pretest baseline to equalize groups outweighs this potential validity threat.

Population and Sampling

The population for this study consisted of Mississippi childcare providers who work in childcare centers throughout the state, where at least one person in each licensed

center is required to be certified in food safety. The sample consisted of Mississippi childcare providers who completed the TummySafe[®] food safety course during the months of April 2005 to June 2006. In total, 2,280 childcare providers were trained during this timeframe, which was coordinated through the 82 MSU-ES county offices. Although 2,280 childcare providers completed the certification exam, the research sample dwindled to 1,625. Reasons for this include the refusal of informed consent by participants, testing irregularities, and cases of missing data, such as unanswered test questions.

Instrumentation

Instruments for this study consisted of a 25-question pretest and a posttest (also called the food safety certification examination). Face and content validity for the instruments was established by a group of experts at MSU. Reliability for the instruments was established using a sample of 77 Mississippi childcare professionals who pilot-tested the course and instruments. This pilot test reflected a Cronbach's alpha of .837 for the knowledge-gain portion of the certification exam. Both delivery groups were allotted an unlimited amount of time to complete the posttest and answered the same questions on both instruments.

Description of Treatment

Traditional Delivery Method. Area nutrition Extension agents scheduled the traditional sessions and advertised them to childcare providers throughout the state. These same area Extension agents served as instructors for the traditional sessions, using only the six lessons on the TummySafe[®] CD-ROM projected on a screen. These Extension instructors attended inservice training workshops on how to consistently teach the educational content.

Between April 2005 and June 2006, 1,267 childcare providers elected to attend the 72 traditional sessions that were scheduled throughout the state of Mississippi. The number of childcare providers attending any one session ranged from three to 29. These traditional sessions included a pretest, the instructor-led learning session including all of the content from the

CD-ROM, and, finally, the certification exam. As with most traditional instruction, participants were encouraged to participate in the sessions and ask questions. Instructors were available to explain concepts in further detail, offer stories, and explore all the learning resources in the curriculum to help encourage learning retention and recall.

Self-Paced Delivery Method. A popular alternative to attending the traditional sessions was the ability to acquire one of the TummySafe[®] CD-ROMs and use it at one's own convenience and learning pace at a personal computer in a childcare facility or home. The remaining 1,013 childcare providers participated via the self-paced computer version of the TummySafe[®] lessons. The software program was designed so that the participant would answer a set of pretest questions scattered throughout the learning modules. Each childcare provider had an individual code assigned to them and there was an accompanying set of installation instructions with each CD-ROM.

Before reporting to the Extension office to take the certification exam, participants had to print out an individual report that indicated they had completed the self-paced modules. This report included their coded responses to the pretest questions. They took the certification exam in a proctored environment to ensure the integrity of the certification exam and process.

Training Materials

One of the first challenges of this endeavor was to develop the food safety curriculum. This was accomplished through a team approach with food scientists and curriculum experts, along with input from MSU-ES agents and the Mississippi Department of Health. The program was named TummySafe[®], and project coordinators developed a set of multimedia learning modules and interactive scaffolding activities to satisfy learning objectives of the food safety course. These learning modules were captured on CD-ROM, a device that would be used by both delivery methods. Extension educators used the CD-ROM as the basis for their traditional sessions and childcare providers acquired the CD-ROM (free of charge) and used it to complete the

self-paced computer delivery method.

The content on the CD-ROM consists of six interactive learning modules that were created using Insite[®] software developed by the Center for Advanced Vehicular Systems at MSU. This content was the same content that was used to teach both the traditional and self-paced delivery method. These six modules were packaged as one program on a CD-ROM with a custom-designed installer and were titled:

1. Food Safety
2. Food Safety Hazards
3. Hand washing, Cleaning and Sanitizing
4. Purchasing and Storing for Safe Food in Childcare
5. Preparing, Cooking, Holding, Cooling and Serving
6. Infant Care

Data Analysis

All pretest data from the self-paced group were coded electronically for inclusion and were gathered from the participants' completion reports. Pretest data from the traditional group, as well as posttest data from both groups, were recorded on bubble forms that were scanned and recorded in the TummySafe[®] database.

Data were analyzed using the SPSS statistical software package. Analysis of covariance (ANCOVA) was used for the purpose of testing the null hypothesis. ANCOVA is used in quasi-experimental studies to adjust the posttest scores for variability of the covariate (Warner, 2007). According to Trochim (2006), any continuous variable can be used as a covariate, but the pretest is usually best because it is usually so highly correlated with itself. An alpha level of .05 was established *a priori*.

Results

The purpose of this study was to determine the extent that different delivery methods (traditional or self-paced) had on the adult childcare providers' knowledge gains as it related to food safety course. The following charts present demographic information of study participants.

The gender of the Mississippi childcare professionals in the research sample was 97% female. Sixty-five percent of the participants were African American (1,069), 32% were Caucasian (528) and the remaining 3% were Asian (six), Hispanic (10), Native American (32), and Other (10). Figure 1 shows the

breakdown of participant race by delivery method.

Figure 2 illustrates how participant age varied by delivery method. Figure 3 shows participants' highest level of education by delivery method, and Figure 4 shows the participants' tenure in the childcare profession by delivery method.

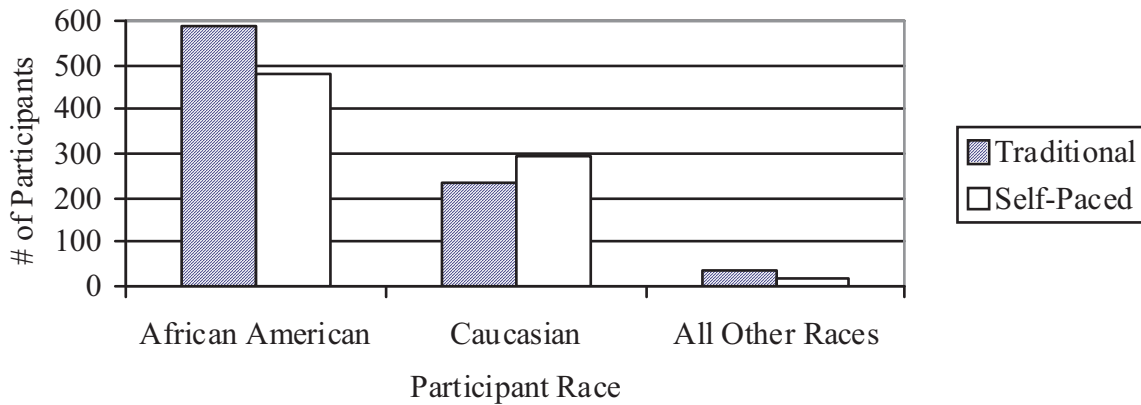


Figure 1. Participant race by delivery method (n = 1,625).

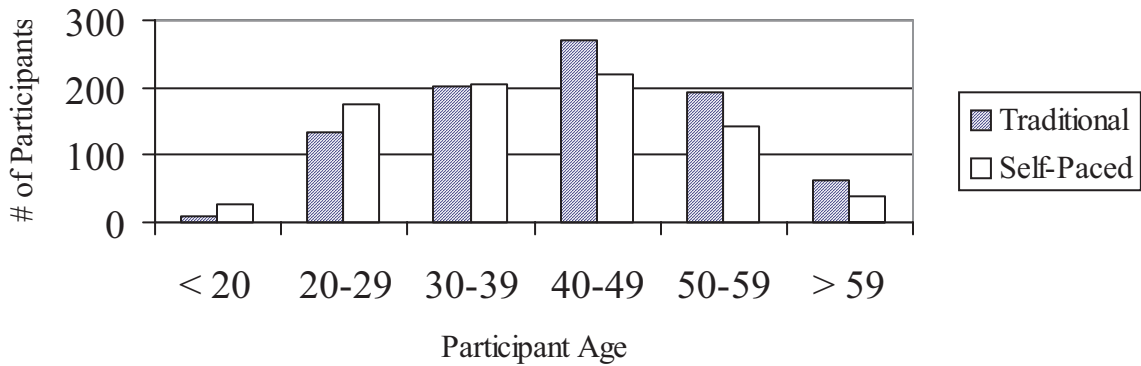


Figure 2. Participant age by delivery method (n = 1,625).

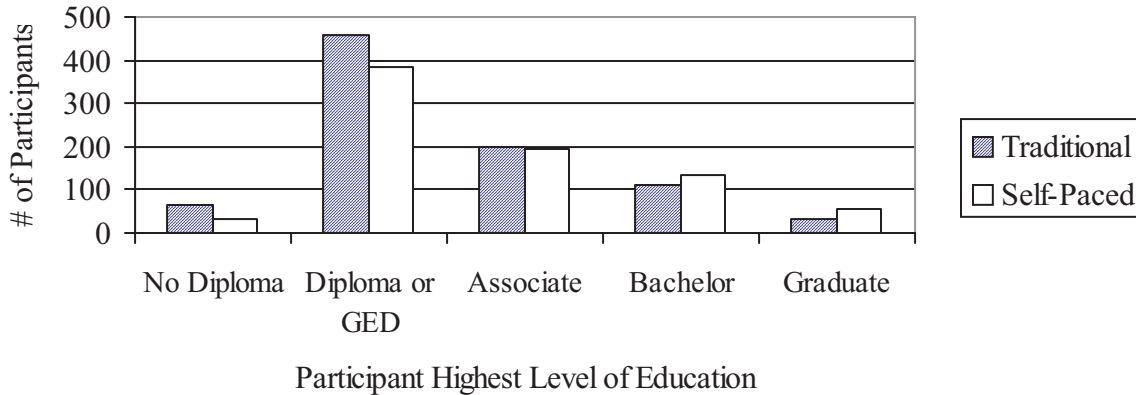


Figure 3. Participant highest educational level by delivery method ($n = 1,625$).

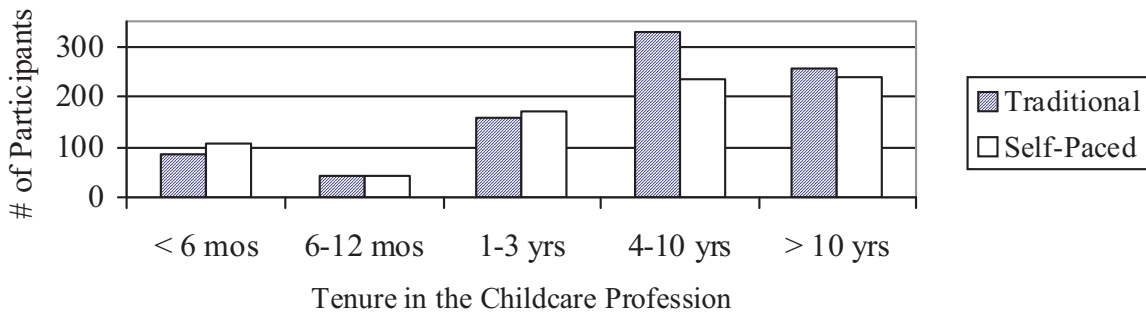


Figure 4. Participant tenure in the childcare profession by delivery method ($n = 1,625$).

The hypothesis was tested using ANCOVA, which is summarized in Table 1. The adjusted posttest mean score for the traditional group ($n = 829$) was 21.59 and for the self-paced group ($n = 796$), the adjusted posttest mean score was 20.06

(out of a total possible 25 points). The ANCOVA revealed a statistically significant difference ($F = 268.00, p < .05$) favoring the traditional delivery method. Therefore, the null hypothesis was rejected.

Table 1
ANCOVA Summary of Knowledge Gains: Adjusted Posttest Means with Pretest as Covariate ($n = 1,625$)

Source	SS	df	MS	F	P
Covariate (pretest)	432.64	1	432.64	125.49	< .001
Teaching method	923.97	1	923.97	268.00	< .001
Residual	5591.97	1622	3.45		
Total	6948.58	1624			

Conclusions and Recommendations

When examining adjusted posttest scores, childcare providers who participated in the traditional delivery method scored significantly higher than those who were involved in the self-paced delivery method. There are several possible explanations for this finding. One potential explanation is that childcare providers are accustomed to learning in a traditional Extension learning environment with a live, competent instructor, and the self-paced delivery, although novel, did not fit their learning styles or needs.

Another potential explanation is that the participants in the self-paced group were not able to successfully remain cognitively engaged and focused on the content of the interactive CD-ROM. To successfully learn the content and pass the certification exam, the student had to master the learning objectives for the TummySafe[®] course. This required a degree of sustained cognitive engagement on part of the childcare providers. However, as indicated by Ormrod (1995), many students are unable to successfully monitor and manage their own learning and to remain engaged and focused on learning tasks. This could especially be the case in busy childcare centers where competing tasks, distractions and responsibilities are prevalent.

Of particular interest is the fact that the pretest scores in the self-paced group were higher than those in the traditional group. Because these pretests were completed at the convenience of the participants, it is possible that childcare providers shared answers on the pretest questions, thus resulting in inflated pretest scores for that delivery method. The pretest scores adjusted the posttest scores in the statistical analysis, which may have influenced the outcome of this study.

Although research analysis found that those in the traditional delivery group were overall more successful in acquiring the learning content, the degree of satisfaction of participants in the self-paced group indicate that it is a learning method that is convenient, meaningful, and compatible with a large number of Mississippi childcare

providers. This is evidenced by comments such as:

- “I really enjoyed the course and learned a few things about the computer as well.”
- “I appreciate being able to complete this course on the computer.”
- “Excellent program - great source of contact hours - very educational!”
- “Keep making it available, it’s wonderful!”
- “What a great and convenient learning tool!”
- “I enjoyed the CD and taking the course at my convenience.”
- “It hit the target on childcare information and it’s convenient too!”

Therefore, it is recommended that future TummySafe[®] food safety courses continue to be taught using both delivery methods.

Discussion

TummySafe[®] proved to be cost effective for many childcare centers. Many childcare center owners and directors commented that by using the CD-ROM version to train staff members that traditionally would not have received food safety training (an Extension goal at the onset of this process), centers were able to gain contact hours for all their staff, not just the kitchen staff.

Because Thompson et al. (2007) found no statistically significant difference in self-paced or traditional learning methodologies for middle school aged children, it would be interesting to find out if the difference found in this study, that shows that the traditional delivery method is more effective in terms of knowledge gain, is based largely on participant age or educational level. Likewise, because no attempt was made in this study to ascertain the levels of computer competence and how that might affect learning outcomes, this is an area recommended for further study.

One thing is obvious: As Extension clientele groups have less time for traditional learning efforts and become more computer savvy, and as Extension educators and curriculum specialists become more adept at developing creative innovative

learning resources, other educational delivery methods will continue to be both a necessary and an effective means of educating the general public.

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