The Effectiveness of Implementing Classroom Response Systems in the Corporate Environment

Brandon M. Heiss

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Committee:
Terry Herman, Advisor
Paul Cesarini
Laney Fugett
Carrie Rathsack
ABSTRACT

Dr. Terry Herman, Advisor

Throughout education and training, instructors strive to create innovative as well as effective tools to assist their teaching skills. For this study, the researcher sought to determine whether the implementation of Classroom Response Systems (CRS) in a corporate environment would be an effective teaching method.

Participants in this study were composed of employees at a Columbus, Ohio reprographics company. The employees were divided into either a control group, which received strictly lecture-based learning, or a treatment group, which used CRS technology integrated within a lecture. Using a pre-test post-test design method, the researcher wanted to determine if there was a difference in the amount of knowledge gained between the two groups. Along with observing a knowledge transfer between the groups, the researcher also wanted to determine whether the CRS technology was easy to use. Finally, the researcher tied in age demographics to determine if Digital Natives were more comfortable with using technology within this study than Digital Immigrants, or vice-versa.

Analyses of the data indicated that there was a difference in scores between the participants using CRS technology integrated within their training lecture and those students whose training was strictly lecture-based. The treatment group scores averaged 11% higher on their post-tests when compared to the control group scores. The researcher also observed participants disclosed in post-test results that CRS technology was easy to
use, innovative, and kept their attention throughout the entire training session. The results of this study indicated that trainers, much like educators in higher education, must teach with engaging technologies as opposed to lecture-based pedagogies only.
Dedicated to my wonderful parents, Harold and Carole, my brothers Matthew and Nathan, and my sisters-in-law Diana and Erika. I also am very grateful for my beautiful nieces Katie and Lauren. All of your endless support and words of encouragement have helped me throughout this process and you are truly the most important people in my life. This is also dedicated to Morgan, for her radiant personality and caring support.

I love you all.
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CHAPTER I: INTRODUCTION

Context of the Problem

Today’s educators and trainers may struggle to capture the attention of their technology savvy students using traditional teaching strategies. The students seem to be uninterested in the presented material and are not interacting in a way that generates group discussion and involvement. The reason for this change in learning preferences has occurred because of a change in our society and technology changing the way our brains work (Prensky, 2001; Siemens, 2004). Students today consume a massive amount of technology whether it is through their computer use, television watching, or even cell phone text messaging. These are students infatuated with interactivity and they want this interactivity to translate into their learning styles as well (Prensky, 2001). School systems and higher education are not the only places where this need for engagement has been presented. In business and industry, it is important that everyone participates in training, because it impacts the company’s effectiveness as a whole. With the increasing need for engaging stimulation by the students, instructors must break up their training sessions with periodic activities that get the entire group involved (Kalish & Middendorf, 1996).

Generating activities can sometimes be difficult, especially when trainers want to think of innovative activities that will appeal to a corporate business group, which will usually consist of more adult learners. Although some of those adult learners could be considered Digital Natives, it is likely that the group will have a blend of Digital Natives and Digital Immigrants (Prensky, 2001). More important than generating activities that appeal to adults, is generating activities that will promote participation from an entire audience. Often times a particular group of individuals will be the only ones participating in class. This is not because they are the only ones who know the material; instead, they are generally the extroverted individuals or the students with more
confidence in themselves. Many other students would be willing to participate if it weren’t for the fear of incorrect answers and public embarrassment (Caldwell, 2007).

An issue that is commonly addressed is the creation of questions that will appeal to a wide variety of individuals with different attitudes and backgrounds in learning, such as culture, economic background, or sometimes multiple factors. Groups of students are grouped by age; however, these different backgrounds cause students to behave differently and learn much differently than their peers (Tomlinson et al., 2003), leaving some students to feel the material is too easy, and others constantly trying to catch up. The majority of the students, however, will learn at a comfortable pace. This strategy still leaves a small percentage of students at a disadvantage because they are not going to participate to their ability. The needs of each student should be taken into account when conducting a training session to ensure the success of the class.

Statement of the Problem

The problem of the study was to determine the effectiveness of Classroom Response Systems in the corporate business environment, specifically in the training platform. The researcher also wanted to determine whether being a Digital Immigrant or Digital Native played a role, based on the use of a new technology.

Significance of the Study

The identification of tools and techniques that enhance the learning processes are often intriguing for instructors. Having that knowledge and being able to experiment with new technologies brings with it a sense of self-gratification and keeps the motivation high to educate students (MacKeogh & Fox, 2008). Over the years, many pedagogical methods have been tried and tested with many of those methods being quite successful. The important things to look for
are the common traits that appear in each of those methods. One study after another over the past
decade has shown that students who engage interactively with each other and the instructor in the
classroom learn concepts better (Wood, 2004). As educators, we must re-invent new methods to
encourage interactivity in ways that do not become monotonous to students in order to keep
learning fresh and engaging (Draper & Brown, 2004).

In today’s training environment, companies strive to gain the competitive advantage and
one area of competitive advantage is speed to market. Being the first to roll out a new piece of
software that speeds up the workflow and cuts down on costs will give a company the upper
hand. This underscores the need for training to be done at a fast, yet efficient, pace (Prensky,
2001). It is important for trainers and educators to use techniques and tools that enable the
training to be as efficient and valuable as possible, but not at the risk of non-effective training.

Current students are primarily active learners and lecture courses may be out of favor
with how students prefer to engage (Carlin & Guthrie, 2004). One question that was important to
explore was the determination of whether the engagement and interactive feel of game
technology enhanced learning, or if the active learning pedagogies lead to increased
effectiveness.

The results of this study highlighted a venue for trainers to communicate with their
audience in a new fashion with tools and techniques that not only create more interaction among
students, but also result in greater learning.

Objectives of the Study

The objectives of this study were to:

1.) Determine the effectiveness of using Classroom Response System technology
in a business’s training environment.
2.) Establish whether or not the Classroom Response System technology was useful in the sense that participants using the technology had a good understanding of how to use the clickers and if their classification of Digital Immigrant or Digital Native played a role in the use of new technology.

Assumptions

1.) Participants had no prior knowledge of the Classroom Response System technology or how to use the technology.

2.) Participants honestly answered the questions.

Definition of Terms

For the purpose of this study, the following terms were operationally defined.

- Classroom Response Systems- The handheld remote system used to answer questions through wireless hardware and presentation software. The entire system is also referred to as Audience Response Systems as well as Student Response Systems while the remote itself is often referred to as a “clicker” (Wood, 2004).

- Digital Natives- Students who are native speakers of the digital language of computers, video games, and the Internet (Prensky, 2001).

- Digital Immigrants- Students who were not born into the digital world, and have to adapt to new technologies (Prensky, 2001).

Summary

The purpose of this section was to provide the reader with a general statement of the problem, the significance of the study, and the objectives to be reached. Some of the issues mentioned were how students learn differently due to the technology and innovation that they are
used to receiving outside of the classroom. With this comes a new challenge for educators to keep learning engaging and interesting for students. The importance of listening to students and their preferred method of learning was important and included as well. Finally, the need to determine whether Classroom Response Systems (CRS), which enhance interactivity and engagement among students, are effective in the corporate environment. Along with determining whether CRS is an effective learning tool, this study also reviewed whether learners are comfortable using this new technology.
CHAPTER II: REVIEW OF LITERATURE

Introduction

To engage a classroom is not an easy task today. With the ever-growing popularity of laptops, PDAs, and smart phones, the availability of technology and opportunities for interactivity are at an all-time high. It has been shown that while students are involved in a self-driven learning project, they learn more and retain more information than when they are sitting passively and listening (Newman & Scurry, 2001). The further examination of how to keep students from being distracted by their technology toys and focusing on the presented material needs to be addressed. Throughout classrooms across the country, many instructors are lecturing to students who may occasionally write some of the material in their notes, becoming strictly a transfer of information (Kalish & Middendorf, 1996; Mazur, 2009). Lecture-based learning is valuable in some circumstances, although the question that needs attention is why does this method of instruction remain so widespread if research supports the idea that students prefer to have some form of engaging activities to break the monotony (Prensky, 2001)? For instance, educators and trainers are often a different generation than their students and may use the outdated teaching methods they experienced as opposed to asking students about their preferred methods of learning (Prensky, 2005). Another reason could be explained by budget cuts in many corporations and higher education institutions (Ehrenberg, 2006). With budget cuts comes less technology due to the high costs and the training sometimes involved. Whatever the reason, learners need to be engaged, participating, and motivated to actively construct knowledge during a learning experience (Brown & Adler, 2008).

American companies spend nearly $60 billion each year on formal job-related training programs (O’Leonard, 2009). When training is conducted solely as lecture-based, it can lead to
ineffectiveness as the average student begins to lose interest just 20 minutes into a lecture without some form of engaging interaction (Caldwell, 2007). Instead, group learning and other forms of social learning are more valuable for the students (Brown & Adler, 2008). Educators can account for this by posing questions to the students throughout the lecture. This process can add interest to standard lecture classes through periodic breaks, an assessment of student opinions, and a check of their current understanding of the content. The end result is an increase in the degree of interactivity (Caldwell, 2007).

This chapter presents a brief history of Classroom Response Systems and their use in the classroom environment. Certain aspects that may apply in a classroom could vary in a corporate environment, and those items are highlighted. The advantages of using CRS technology in a corporate environment will also be explored. The features noted would be the ability a CRS unit has to engage users and keep the students interacting with each other and the trainer constantly. Another element explored will be the power to obtain instant feedback in the classroom as well as gauging the student’s understanding of the material being presented.

Along with the cases of CRS technology currently being used, this chapter will examine generational implications through an exploration of the Digital Native and Digital Immigrant groups identified by Prensky (2001) based on their experience with technology. The generational differences could potentially play a role in understanding how to best implement the CRS technology.

The widely used Kirkpatrick four-level evaluation method will be introduced as an important resource to use while evaluating training programs. To determine whether a training program has been deemed effective, some measurement to gauge a variety of aspects that impact the evaluation should be included.
Lastly, the importance of not overusing technology will be introduced. Some teaching methods and technologies could become numbing to students and they do very little active processing if the teaching strategies are unoriginal (Cutts, Carbone, & Van Haaster, 2004). It is important that educators can provide innovative teaching methods that captivate their students; however, educators cannot rely on these methods as their only way to teach (Banks, 2006).

**Classroom Response Systems**

Research validating the success of a new technology is a good gauge for implementing a technology into a teaching environment. Higher education instructors have found that Classroom Response Systems have been shown to help facilitate and enhance learning (Conoley, Moore, Croom, & Flowers, 2006), although the lack of results in business and industry highlights the need for more research in the effectiveness of implementing this technology within the corporate environment.

One example of the Classroom Response Systems being used in an effective way was demonstrated at the Queensland University of Technology within the School of Law, located in Brisbane, Australia (Burton, 2006). Here, the undergraduate law students attended a 2-hour lecture and 1-hour tutorial weekly during a 13-week semester. During week 5 of the lecture-based course, the instructor used the Classroom Response Systems to facilitate problem-based learning. The law students who were in the class were very familiar with lectures being conducted using Microsoft PowerPoint; however, they had described this technology as being boring because it was overused and was no longer stimulating their learning (Burton, 2006). During the week the CRS technology was tested, there were 140 full-time law students and 40 part-time law students who attended the lecture and tutorial. The professor used the CRS technology to assist the students in problem-based learning, which enabled students to become
more active in the work and discovered content that allowed them to solve real law problems (Merrill, 2007). An example question asked was displayed on a PowerPoint slide with a list of four possible answers to the factual problem on the next slide with one answer being correct. After the lecturer read the problem, students were given several minutes to reread the problem and answer the question using the keypad on their clicker. At the end of the lecture, the students were asked three questions to get an understanding of what they thought of the CRS technology. The three statements were:

1. The Audience Response System helped me to learn the lecture materials.
2. It was useful to compare my responses with the responses of other students.
3. The Audience Response System should be used in more Law lectures.

Using a 5-point Likert scale (strongly agree through strongly disagree), the students responded to these three statements anonymously using their clickers. Each of the three statements overwhelmingly had over 85% of the students answering strongly agree, agree, or neutral.

Another example of effectively using Classroom Response Systems in higher education occurred in a microbiology course at Colorado State University, located in Fort Collins, Colorado (Suchman, Uchiyama, Smith, & Bender, 2006). In this case, the instructor implemented CRS technology into two separate classes in two different ways. In the first class, the instructor integrated questions into the lecture during the entire class period, and the students answered questions using clicker devices. The second class received those same questions; however, this time they were not integrated and instead were asked at the beginning of class as extra credit points. Although the choice of using clickers was optional in the classes, 95% of the students in the first section and 87% of students in the second section participated in using the clickers. The student performance on examinations was measured on lecture content that was
consistent in both classes, as well as the questions asked using CRS technology in both classes. The students in the first section who used the clickers throughout the entire lecture period scored 10.91% higher on the examinations than the students who used the CRS technology at the beginning of the class for extra credit. This data helped support the need to maintain students’ attentiveness throughout the class. Along with higher exam scores, the students in the first section expressed more confidence in their knowledge and felt more engaged than students in the second section based on survey questions asked, pertaining to the use of CRS technology, at the end of the semester.

In addition to being implemented in the higher education platform, Classroom Response Systems are being used in the healthcare industry to test postgraduate medical trainees at St. Elizabeth Hospital in Chicago, Illinois (Schackow, Chavez, Loya, & Friedman, 2004). Each month, the hospital would present a 1-hour moralistic lecture from the Family Medicine Residency Midday Core Didactic lecture series. The lecture was given twice during the month in two different ways. The first lecture was given by strictly lecturing, with no questions being asked throughout the presentation and very little interactivity between the lecturer and the trainees. A second lecture was given to a different group, whom were provided Classroom Response Systems, and asked to answer multiple-choice questions throughout the lecture based on the provided lecture material. During both lectures, the trainees were given pre-tests that determined the amount of information previously known based on the subject of that particular lecture. At the end of both lectures, a post-test was given that included seven questions that were specifically asked during the lecture where the audience used the CRS technology, but not directly asked to the audience in the basic lecture. On top of those seven questions pertaining to the lecture material, three other questions that consisted of general medical knowledge were
added to make the post-test 10 questions. One month after the quiz was initially given, the hospital would administer the same quiz to measure the retention of material knowledge.

The results of the quizzes as a measure of evaluation determined that learning during the non-interactive lectures resulted in an average score of 61% whereas at the lectures using CRS technology the average score earned was 96%. When the audience was tested again 1 month later, the quiz scores dropped to 48% for the non-interactive lectures and to 67% for the group using CRS technology. In this non-academic setting, it is interesting to see that the rate of correct scores among this test was dramatically improved when the CRS technology assisted the lectures by producing a more interactive environment for the audience (Schackow, Chavez, Loya, & Friedman, 2004).

Digital Natives and Digital Immigrants: Generational Implications

Two popularly described learning groups are widely reported today. The first group of learners is considered the Digital Immigrants, consisting of adults born previous to 1979, who grew up without the constant interaction with the Internet, video games, and other multi-stimulating technologies (Tapscott, 1998; Prensky, 2001). The other group is known as Digital Natives, or Net-Generation (Prensky, 2005). These Digital Natives, who typically consist of learners under the age of 30 as of today, have been enthralled with interactive technology while never having known a world without the Internet. A dichotomy of learning styles emerges when a group of Digital Natives and Digital Immigrants are blended in a common learning setting. This becomes an issue today when students want educational products and services tailored to their needs instead of a one-size-fits-all course in terms of content and pedagogy (Dede, 2004). In this setting, it is difficult for a trainer to target the group using technology, because of the
possible learning curve that may apply to the Digital Immigrants, yet abandoning technology completely could possibly hinder the learning of the Digital Natives.

More common than blending Digital Natives with Digital Immigrants, frequently the Digital Immigrants are teaching the Digital Natives by using the same methods that they grew up with and learned from (Prensky, 2001). Prensky also suggests that the generational gap between Digital Natives and Digital Immigrants is the reason for the “decline of education in the United States” (p. 1). The Digital Natives become tired of using up class time to view overhead slides, PowerPoint, or to meet in groups, because the interactive technology has changed the way students like to gather with their peers, accept, and retain information (Brown & Adler, 2008). Digital Immigrant instructors, who speak an outdated language, are struggling to teach a population that speaks an entirely new language (Prensky, 2001). So whom should instructors target? Prensky (2001) believes the Digital Natives would be unwilling to go backwards and today’s Digital Immigrant teachers have to learn to communicate in the language and style of their students. Along with acquiring new communication strategies, Prensky notes dropping step-by-step teaching and picking up the pace of instruction, specifically with the use of computer games and other technological tools of the digital age to keep students attentive (2001).

Evaluation

The evaluation process of a lecture or presentation shouldn’t be limited to the conclusion of the program; instead Donald and James Kirkpatrick (2006) present a four-level process to the evaluation of training programs (Table 1). The first level of evaluation, which should be completed throughout a presentation, is the reaction level. The reaction level gets a sense of attitudes and thoughts that are being projected by the students or participants. One effective indication of engagement by users is their appreciation of the actual presentation, and with the
reaction level, the presenter can gauge this throughout the presentation and decide whether to
continue with the current type of training or to re-evaluate mid-presentation and choose a
different approach. An example of the reaction level that can be implemented during a training
session would be to interject periodically by asking whether or not the group understands the
content up to this point and how the information is applicable to their role in the workplace
(Kalish & Middendorf, 1995). The reaction level lays the groundwork for Kirkpatrick’s entire
evaluation process. Along with laying the groundwork, this type of evaluation is widely used due
to it being so easy and inexpensive to administer (Kruse, 2002).

The second level of the evaluation process is the learning level. This is the point where
the educators can see to what extent the participant’s level of knowledge has changed and to
what degree. Researchers must first use pre-tests to show that there was a change in the
participant’s knowledge. A common way to determine whether learning took place or not is by
giving a pre-test, which determines the amount of previous knowledge or the entry level skills on
a particular subject, then administering a post-test and analyzing the amount of knowledge
gained during the training program. A main component that must be preserved during these tests
is the parallel between the pre-test and post-test and that the questions are truly written to reflect
the learning objectives (Kruse, 2002). These tests must be the exact same so they can measure
the same abilities of the participants (Basarab & Root, 1992). If the scores from the pre-test did
not improve the second time the participants were tested, researchers can observe little to no
change within the learning level.

Following the learning level, another essential level in the evaluation process is the
behavior level. In the behavior level, the user is tested to see whether or not the newly acquired
material is being used to enhance the trainee’s production. Similar to the other forms of
evaluation, there must be some form of measurement in the behavior level to determine whether
the trainee has had a knowledge transfer. Evaluation is hardest to assess in this level of the
learning process due to the fact that it is difficult to predict when the change of behavior will
occur (Clark, 1997 & Hoffman, 1999). Due to this difficulty, the time in which to evaluate is
difficult to determine, as well as how to evaluate the trainee. Because of this intricacy, there is
one final level to Kirkpatrick’s evaluation model that can be added on to the behavior level and
that is the results level.

In the results level, the trainers and executives can establish whether the training was
successful towards the bottom line of the business or activity. The point one must recognize on
this level is that it cannot be implemented immediately. According to Kirkpatrick, it is wise to
allow 6-12 months before starting to observe results. By allowing added time before this stage of
evaluation, you are letting the behavior level (level three) fully develop. The most obvious form
of evaluating the results level is by seeing if the trainees are now implementing their newly
learned skills to either produce more widgets, make fewer mistakes, or are practicing safety
techniques more frequently throughout their everyday job functions.

Another way to test the trainees is to have a treatment and control group, therefore being
able to measure if there is a distinct difference between the group with treatment applied versus
the group that had no special treatment. The results level is also where trainers begin to see a
return on investment, which is the cost put into the training program versus the benefits observed
and received at the end of the evaluation level.

The results level of evaluation is an area that constantly needs attention and this level
typically does not stop being measured. If there are signs of weakness within the company’s
safety practices for new employees, this indicates the need to re-train the employees so that the
safety within the company stays at or above its necessary standard. This is where the training department can demonstrate to the executives or human resources department whether a training program should be continued, modified, or to justify the need and existence of the successful training (Kirkpatrick, 2005). Although executives see a need for training in their company, the training department needs to continue to prove its competency through workshops and training seminars. With the evolution of new technologies each month, it is important to realize what works and what doesn’t work, and report to the executives how training and noticing trends at the evaluation level can directly affect their bottom line.

Table 1 – Kirkpatrick’s Four Levels of Training Evaluation

<table>
<thead>
<tr>
<th>Level</th>
<th>Type (What is measured)</th>
<th>Evaluation, Description, and Characteristics</th>
<th>Examples of Evaluation</th>
<th>Relevance and Practicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reaction</td>
<td>Reaction evaluation is how the delegates felt about the training or learning experience</td>
<td>‘Happy sheets,’ feedback forms; Also verbal reaction, post-training surveys, or questionnaires</td>
<td>Quick and very easy to obtain; Not expensive to gather or to analyze</td>
</tr>
<tr>
<td>2</td>
<td>Learning</td>
<td>Learning evaluation is the measurement of the increase in knowledge—before and after the training</td>
<td>Typically assessments or tests before and after the training; Interview or observation can also be used</td>
<td>Relatively simple to set up; clear-cut for quantifiable skills; Less easy for complex learning</td>
</tr>
<tr>
<td>3</td>
<td>Behavior</td>
<td>Behavior evaluation Observation and Measurement of</td>
<td>Observation and</td>
<td>Measurement of</td>
</tr>
</tbody>
</table>
is the extent of
applied learning
back on the job –
implementation
interview over time are
required to assess
change, relevance of
change, and
change, and
behavior change
typically requires
cooperation and skill
of line-managers
sustainability of change

4 Results Results evaluation is
the effect on the business or environment by the trainee
Measures are already in place via normal management systems and reporting – the challenge is to relate to the trainee
Individually not difficult; unlike whole organization;
Process must attribute clear accountabilities

Sometimes a fifth level is considered during an evaluation and that is the Return-on-Investment (ROI) level. An ROI calculation (benefits minus costs, then divided by costs and multiplied by 100) can go a long way toward predicting the results of business training; however, it should not be used as the only method of evaluation (Horton, 2001). Horton also mentions that sticking with conventional training is the most predictable and safe method.

Potential Pitfalls of Integrating New Technologies

With the implementation of new technologies such as the Classroom Response Systems, instructors must not abuse or overuse the new technologies that are presented to create new and refreshing ways of instructional delivery. Some students even say overusing new technology makes teachers less effective than if they were to just use a chalkboard (Young, 2004). Originally there were blackboards with chalk, one of the earliest methods of displaying material
to a classroom. With the creation of PowerPoint, instructors were able to captivate student attention with bright colorful slides and the ability to embed photos and videos within the slide. Many instructors limit their teaching strategies to PowerPoint throughout the entire semester. The students become numb to the redundancy of the instructor reading PowerPoint slide presentations to them and students lose their focus and engagement in the content (Young, 2004; Clark, 2008). This example signifies the importance of not overusing technological innovations in lectures, because overuse or inappropriate use leads to ineffectiveness (Burton, 2006). This theory applies more than to just education and instruction as we see the number of jobs we will have in our lifetime increasing from our parents’ and grandparents’ time due to the fact that we are no longer satisfied with just one employer (Gonzalez, 2004). We want more, whether that may be better benefits, more pay, or a better opportunity for growth (Dijkstra, 2008). This theory may relate to a student’s need for change when it comes to moving forward and moving away from old technologies and teaching habits.

Summary

The implementation of CRS technology in higher education has received high marks in relation to promoting interaction between students and instructors, as well as enabling the class as a whole to participate as opposed to just the more extraverted students in a learning environment (Beatty, 2004). The question remaining to be answered is the ability and effectiveness of using CRS technology in the corporate training environment. Instructors must leverage the interaction students receive outside the classroom to keep students engaged and interested in subject material in the learning environment. Technologies, in particular computers and cell phones, have shown to be distracting within the classroom (Campbell, 2006). These technologies can often compete with class materials without a certain level of competing
interaction. With the difference between Digital Natives and Digital Immigrants, instructors have to analyze their audiences carefully when giving presentations because of the possibility of leaving one group in the dark. Teachers must be able to grasp the attention of the Digital Natives through new technologies and stimulating activities, while not burdening the learning curve for the Digital Immigrants.

Lastly, looking at evaluation, there are Kirkpatrick’s four levels of evaluation that need to be considered during and at the conclusion of any training seminar. Throughout the seminar, instructors must be aware of any reactions that may be occurring and continue the approach they are taking or be flexible to any changes that may need to take place based on those reactions. Other stages that occur after the training has taken place consist of the learning level, which measures if any information was gained generally by giving some form of test, and the behavior level combined with the results level takes into consideration if the audience is applying the intended knowledge to their everyday lives. An evaluation method is sometimes overlooked, but critical in determining whether the training or instruction is valuable, or if it needs to be modified. Although the CRS technology has gained popularity in higher education, the result of overusing such an interactive technology could be a pitfall in the learning environment. If this does occur, instructors will be forced to search for new methods to captivate their audiences in ways they have never experienced.
CHAPTER III: METHODOLOGY

Methods and procedures of the study were described in this chapter relating to the research design, characteristics of the research sample, data collection instrument, and procedures for data analysis.

Restatement of the Problem

The problem of this study was to identify the effectiveness of implementing the Classroom Response System into a corporate training environment.

Research Design

In order to determine whether or not the implementation of the Classroom Response System device enhanced the learning of corporate employees in a training session, training was conducted at an actual business. The researcher arranged a training session during the month of February 2009 at Franklin Imaging, which is located in Columbus, Ohio. Franklin Imaging is a reprographic company that specializes in small and large format printing needs as well as document management. The researcher was given permission to conduct the Occupational Safety and Health Administration (OSHA) training for the month of February at Franklin Imaging, focusing on Fire Extinguisher Use and Safety.

The OSHA Fire Extinguisher training was set up using four different groups, two of those groups using the CRS technology integrated into the lecture (treatment groups), and the other two groups using a strictly lecture-based PowerPoint presentation (control groups). The sample studied here was a convenience sample of 34 workers selected by the operations manager at Franklin Imaging. The researcher was given 45 minutes to complete each of the training sessions, which is the same amount of allotted time provided at each month’s safety training. The groups were determined based on employee’s schedules and also taking into consideration a
training session on a new piece of equipment that occurred on the same day. The operations manager assisted the researcher in choosing one treatment group and one control group in the morning. Based on convenience and to make the number of participants close to even, the operations manager decided to have the second treatment group and second control group in the afternoon.

Before all participants began the training, the presenter handed out a consent form to the participants from the Bowling Green State University Human Subjects Research Board office to sign that they were willing to participate in a study for a Thesis (Appendix A). All participants in both treatment groups were willing to participate and signed consent forms. The participants were also asked to take a written pre-test (Appendix B) to measure their knowledge of Fire Extinguisher Safety before receiving any training. The possible maximum score for the pre-test was 14 points. The pre-test is employed to measure whether the knowledge levels of the groups are equal before the training (Campbell & Stanley, 1963).

To determine how significant of a difference there was between the control group and treatment group, an evaluation was given at the conclusion of the training seminar. The researcher chose to use a pre-test and post-test control group design, which is considered a quasi-experimental design and as the name implies, includes a pre-test to determine what knowledge the audience already possesses in a training topic, and relates those scores to the knowledge that is gained on their post-test scores.

The one aspect that quasi-experimental designs fall short on is their lack of randomization (Heffner, 2004). The type of quasi-experimental design implemented in this study was a pre-test post-test nonequivalent group meaning that we chose our participants based on convenience and those who participated using the CRS technology were considered our
treatment groups, and the participants who did not use CRS technology were considered our control groups.

Upon receiving the remote controlled clickers, the trainer provided the treatment groups a brief instruction on how to use the TurningPoint™ CRS software and then prompted the participants to answer a trial question before the actual training session began. Everything from the presenter to the training room, and the actual content remained consistent in both treatment groups, with the exception of new participants.

Both treatment groups’ training included remote controlled Classroom Response Systems and a unique PowerPoint presentation with the addition of questions interspersed periodically throughout the presentation (Appendix C). The questions were integrated using TurningPoint™ software, which allows students to submit answers using a wireless remote via radiofrequency signals to a base station attached to the computer. The student’s responses then appeared on a subsequent slide, which allows the instructor and learners to view the results in real-time. The addition of these questions attempts to encourage group discussions of the topic between the audience and the trainer and also to determine if the learners understood the content. When the CRS integrated questions were asked, the trainer required that all participants entered an answer into their clicker before moving on. The trainer was able to determine all participants had answered through a feature built into the TurningPoint™ software. This process ensured that the trainer had full class participation before discussing the results on the following page.

At the conclusion of the CRS integrated PowerPoint training session, the treatment group participants were asked to complete a written post-test (Appendix D) to measure how much knowledge was gained from the training. The possible maximum score for the post-test was 14 points. With the post-test, the participants were asked to put their age at the top of their test so
the researcher could determine whether they were a Digital Native or Digital Immigrant. The total time for the treatment group session was 35 minutes, due to the instruction on how to use the clickers.

Before the control groups were trained, they too were asked to complete a Human Subjects Research Board consent form (Appendix A) saying that they were willing to participate in the training session. All participants in both control groups agreed to the form and signed. Everything from the presenter to the training room, and the actual content remained consistent in both control groups, with the exception of new participants.

Similar to the treatment group, the control group also took a written pre-test (Appendix B) to measure their previous knowledge of Fire Extinguisher Safety. The possible maximum score for the pre-test was 14 points.

Upon completion of the pre-test, the trainer began a lecture-based training session using the same PowerPoint presentation the treatment group received, with the exception of integrated CRS questions (Appendix E). Those same questions asked with the CRS technology were asked orally for the control groups, leaving only one participant being able to answer the question. During the times the presenter had CRS questions in the PowerPoint for the treatment group, the presenter asked the same questions verbally to the control groups, there was little learner participation in the control group, with the exception of one participant. That one participant answered four out of the six questions presented.

At the conclusion of the lecture-based training session, the control group participants were asked to complete a written post-test (Appendix F) to measure how much knowledge was gained from the training. The possible maximum score for the post-test was 14 points. With the post-test, the participants were asked to put their age at the top of their test so the researcher
could determine whether they were a Digital Native or Digital Immigrant. The total time for the control group session was 25 minutes, shorter than the treatment group, due to no explanation needed for the clickers.

The post-tests for both control groups and treatment groups were intended to measure two different objectives. The first objective the researcher was looking to determine was whether or not there was a transfer of knowledge, meaning by what percentage did the scores change from the pre-test after the training had been presented. Since this objective dealt with a transfer of knowledge, the first group of questions on the post-test dealt with strictly lecture material content. An example question was:

1. An example of two “Class B” fuels would be:
   
   _____ Cardboard, Newspapers
   _____ Lamp, Hot Plate
   _____ Grease, Paint Thinner

The question was then followed by several possible choices, with only one choice being correct.

The second objective was to establish whether or not the technology presented was useful in the sense that participants felt it was effective to use, whether it was innovative, and if it kept their attention throughout the presentation. Since the control group had no information given to them about the Classroom Response Systems, these questions were presented in general terms as to how the users like to receive information in training seminars. Considering the control groups never used any real hands-on technology, the trainer asked them to associate the word “technology” in these questions as a reference to the PowerPoint slides. The treatment groups were asked to associate the word “technology” in these questions to the Classroom Response Systems and clickers that they used during the presentation. Some examples of these questions
using a Likert scale are:

1.) Today’s training seminar was informative.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly Disagree

2.) The interaction and use of technology between the user and the audience was innovative.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly Disagree

The researcher asked 14 content related questions and four instructional delivery related questions in the post-test. With a combination of questions that apply to two separate objectives, the researcher was able to ascertain if the actual training topic was effective by seeing if there was knowledge gained between pre-test and post-test scores. The researcher also was able to determine if the treatment groups enjoyed using the CRS technology and compared those scores to the control groups, which were taught using a lecture-based presentation.

Hypothesis

The hypothesis of this study was:
H₀: A training program delivered with the integration of a Classroom Response System would result in a positive effect on learner content retention (learning) and overall training satisfaction, which was tested against the alternative:

H₁: A training program delivered with the integration of a Classroom Response System would result in either no effect or a negative effect on learner content retention (learning) and overall training satisfaction.

During the training seminar, the researcher expected to obtain full participation from the treatment group, who used the Classroom Response Systems. The control group was verbally asked the same questions asked at the same points in the training. The researcher also predicted positive reactions from the treatment group throughout and after the training seminar, as well as positive results in the post-test evaluation pertaining to the instruction method itself. Finally, the researcher predicted a difference (better scores) in the post-test scores for both the control groups and treatment groups at the conclusion of the training session.
CHAPTER IV: FINDINGS

The results of the research study are discussed in this chapter, including information pertaining to the research question, and data analysis.

Evaluation of CRS Technology

The researcher implemented two different forms of evaluation of the training seminar to determine whether the use of CRS technology was effective in the corporate environment. The first objective was to determine the degree to which scores changed, while comparing the treatment groups versus the control groups. The second objective was to determine whether the students found the CRS technology easy to understand. The model used, Kirkpatrick’s four-level process, proved successful in the reaction phase, which was the observation of thoughts or feelings of the audience (Kirkpatrick & Kirkpatrick, 2006). The reactions to the technology in the treatment group, observed by the researcher, were positive in the fact that although the audience had never seen or used the technology, the ability to learn how to use the CRS technology was easy. During the post-test, the participants from both the control groups and the treatment groups were asked questions about the presentation of technology used during the training. When the word technology is used in these questions, the control group was asked to relate that to the lecture-based PowerPoint technology. The treatment group was asked to relate the word technology to the TurningPoint™ clickers and their integration within the PowerPoint presentation. The following figures relate to those four questions:
With the exception of one outlier shown in Figure 1 (one participant selected disagree) from the treatment group, the overall effectiveness as reported by the participants was not affected by the use of CRS technology.
Noted in Figure 2, the researcher observed that the implementation of CRS technology was perceived as more innovative, which contrasts the control group’s PowerPoint only method of instruction.

**Figure 3: The technology used today was easy to understand.**

![Bar chart showing ease of use](chart.png)

Figure 3 displays data in response to the question of ease of use in regard to the CRS technology. The CRS technology was regarded as a more easy technology to understand than the lecture-based only PowerPoint technology. With the blended demographics, this revealed that with a good explanation of how to use a technology, Digital Immigrants will be able to understand CRS technology as well as the Digital Natives.
As seen in Figure 4, the final question the researcher presented in relation to the technology and the general presentation, dealt with gaining and maintaining the participants’ attention. The researcher observed that the majority of participants in the treatment group strongly agreed that the use of CRS technology helped maintain their attention throughout the training seminar. As Marc Prensky noted, interactivity is needed for learners today. Without some form of interactivity during instruction, students’ minds begin to wander and become saturated with other important issues in their lives (Prensky, 2001).

Analysis

The researcher chose to use a pre/post design to determine the knowledge previously known compared to the knowledge gained from the training session. The first comparison the researcher wanted to determine was the previous knowledge on fire extinguisher safety training.
Table 2 shows the numbers provided to the researcher that compares the differences between the control group and treatment group pre-test scores. The total possible score for the pre-test was 14 points.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Dev.</th>
<th>Std. Err.</th>
<th>Median</th>
<th>Range</th>
<th>Min.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>16</td>
<td>6.4375</td>
<td>6.1292</td>
<td>2.4757</td>
<td>.6189</td>
<td>6</td>
<td>11</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Treatment</td>
<td>18</td>
<td>7.1667</td>
<td>6.5</td>
<td>2.5495</td>
<td>.6009</td>
<td>7</td>
<td>10</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

A primary concern was to determine if the groups had similar previous knowledge in the subject of fire extinguisher safety. As noted in Table 2, the scores from the treatment group had a mean score that was .73 points greater than the control group. Two outliers could be responsible for this difference in pre-test scores. The problem with outliers was that they can distort the results of a statistical test (Mertler & Vannatta, 2002). In the control group, there was one participant who scored a 1 out of 14 on his or her pre-test, which lowered the mean overall for the control group's mean score. That participant only answered one question on the pre-test, and instead of guessing possible answers, he or she left the remaining 13 questions blank. In the treatment group, there was an outlier pre-test score that raised the overall mean. One participant scored a perfect 14 on his or her pre-test, which could be associated with a strong knowledge on fire extinguisher training before the training occurred. To show how similar the two groups were before the training took place; the researcher removed the outliers that affected the mean scores for both groups. If the score of 1 in the control group were taken out, the mean score would be adjusted from 6.4375 to 6.8. If the score of 14 in the treatment group were taken out, the mean score would be adjusted from 7.1667 to 6.7647. Without the outliers, the difference between
mean scores was .035 as opposed to .729 with those outliers included. These outliers were only removed for the purpose of showing an even knowledge level between the groups previous to the training session. No scores were removed from the actual results.

The actual objective that the researcher wanted to obtain in this study was the comparison between the control group’s post-test scores versus the treatment group’s post-test scores. When comparing the post-test scores, the researcher sought to determine the difference in knowledge gained during the training session. Figure 5 shows a visual of the control group’s post-test scores and Figure 6 shows a visual of the treatment group’s post-test scores.

![Figure 5: Control Group Post-Test Scores](image)

![Figure 6: Treatment Group Post-Test Scores](image)
While observing Figures 5 and 6 and Table 3, the treatment group had overall higher post-test scores. It is most clear within Table 3 when looking at the mean score for the treatment group, which was 1.53 points greater than the scores from the control group. When these tests are graded statistically, those 1.53 points come out to a difference of an 11% better score from the treatment group, which used the CRS technology. That 11% reported was very similar to the microbiology study at Colorado State University mentioned in the Review of Literature. That study saw 10.91% better exam scores for students using CRS technology throughout the
semester. Another statistic worth noting within Table 3 was the range of scores between each group. The range of the control group’s scores was from a low score of 8 (57%) to a maximum score of 14 (100%), making the range 6. The treatment group’s range was half of that with the lowest score being an 11 (79%) and the highest being 14 (100%), for a total range of 3. Finally, the number of participants who registered perfect scores was different between the two groups. The treatment group had a total of 8 participants registering a perfect score, whereas the control group had just one perfect score.

The last item the researcher measured was to determine whether or not age demographics played a role with using the CRS technology. Referring to Table 4, the researcher determined a fairly even mix of age groups within the study. In the treatment group, 50% of the group was determined to be Digital Natives, and 50% of the participants were Digital Immigrants. The control group composed of 43.8% Digital Natives, and 56.2% Digital Immigrants. Based on the demographics of the participants in this study, the researcher determined that the difference of being a Digital Native or a Digital Immigrant played no important role in this study.

Table 4 – Participant Demographics

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Treatment Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-24 (Native)</td>
<td>6 (33.3%)</td>
<td>3 (18.8%)</td>
</tr>
<tr>
<td>25-29 (Native)</td>
<td>3 (16.7%)</td>
<td>4 (25.0%)</td>
</tr>
<tr>
<td>30-34 (Immigrant)</td>
<td>4 (22.2%)</td>
<td>3 (18.8%)</td>
</tr>
<tr>
<td>35+ (Immigrant)</td>
<td>5 (27.8%)</td>
<td>6 (37.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>18 (100%)</td>
<td>16 (100%)</td>
</tr>
</tbody>
</table>
Overall, the two major findings determined from this study were that with the exception of two outliers in the pre-tests, the participants had an even knowledge previous to having been trained. In consideration of that data, the post-test scores provided a valid comparison as to whether or not knowledge was gained from the training. In that comparison, the treatment group, which was trained using Classroom Response System technology, averaged more than 1.5 points greater on their post-tests than the control group. The second finding noted by the researcher was that participants favored using an innovative technology, as it helped maintain the participants attention throughout the training class. The treatment group participants also noted in Figure 3 that the CRS technology was easy to understand, and among a mixed demographics group, this provides hopefulness in the future of technology in adult and mixed learning groups for corporate training.
CHAPTER V: SUMMARY AND CONCLUSION

The identification and influences that affect learning is important to educators. Although it is important to go through the proper training in order to become an educator, another important factor is to keep your audience engaged in the material, and without that, the educational process is deterred. The summary of the study was based on the objectives of the study.

Summary of the Study

Objective 1: The first objective was to determine the effectiveness of using Classroom Response System technology in a business training environment. The researcher incorporated Donald Kirkpatrick’s four-level process of evaluation to determine whether the training was more or less successful when CRS technology was implemented. In addition to Kirkpatrick’s model, the researcher also used a pre-test/post-test model to establish whether or not knowledge had been gained throughout the training session.

Objective 2: This objective was to analyze the data gathered and establish whether or not the Classroom Response System technology is useful in the sense that participants using the technology enjoy it, and have a good understanding on how to use the clickers. The researcher decided to ask four questions related to the use of the clickers and asked if they helped or hindered learning the training material. Tables 1 through 4 in Chapter IV represent the results found for this particular study.

Conclusion

Analyses of the data indicated that there are some commonalities to using Classroom Response System technology during a training session and gaining higher test scores on training
related quizzes in the corporate training environment. The researcher decided upon using two forms to measure the effectiveness of implementing Classroom Response System technology into the corporate environment.

The first method measured how the participants felt about using the Classroom Response Systems. This process was done by asking four questions and answered using a 5-point Likert scale. The strongest results came from the questions regarding the innovativeness of the technology, the ease of use, and the ability to maintain attentiveness throughout the training presentation. The treatment group was more likely to answer more positively in the Likert Scale in these three categories than those who answered the same questions in the control group. The one question that saw nominal differences was the question related to the overall information provided in the training session. The CRS technology had minimal effect on whether the users thought the training session was more or less effective.

The second method measured the amount of knowledge gained using the CRS technology using a pre-test/post-test method and comparing the post-test scores to the control group. The researcher first conveniently assigned members to each group tested and determined that the participants had an even amount of previous knowledge on the training subject. Once this was established, both groups underwent similar experiences, with the exception of the CRS technology being implemented for the treatment group. Upon completion of the training sessions, both groups were tested with the exact same post-test and the scores were compared. The treatment group, which used the CRS technology, earned scores that averaged 1.53 points better than the scores earned by the control group. Along with a better mean score, the range of scores among the treatment group was from 79% to 100% with 8 participants registering perfect
scores. The range of scores among the control group was from 57% to 100% with only 1 participant registering a perfect score.

The results of these two forms of measurement help support the effectiveness of implementing Classroom Response Systems into a corporate training environment. The need to provide stimulation and innovativeness will continue to be an issue for educators no matter what the platform for learning may be.

Recommendations for Further Research

1.) Develop an instrument that tests the group to determine what part of the technology was most helpful to them, as well as what may have hindered the learning.

2.) Compare long-term effects over whether or not CRS technology helped participants in retaining information over a period of great length.

3.) Determine whether or not CRS technology would be useful on other platforms other than higher education and corporate environments. CRS technology might also be useful in K-12 education or possibly used with elderly individuals as a platform to learn technology.
References


Dear Participant,

My name is Brandon Heiss and I am currently a second year master’s student in the Career & Technology Education program at Bowling Green State University. I would like to gather information to assist me in the completion of my thesis. My thesis is exploring the effectiveness of implementing classroom response systems (clickers) into a business environment. This research has the potential to help businesses for miscellaneous work tasks that occur daily. Today, I am going to use it for training purposes.

Please consider participating in this short survey. Your name and answers will be kept strictly confidential and any data reported will be in aggregate. If you agree to participate, you will answer a series of questions regarding today’s OSHA training. These questions will ask for your opinions and preferences, there is no right or wrong answer. All responses will be kept confidential and in my possession. The files will be destroyed after the study is completed. Participation is voluntary and will no way affect your employment at Franklin Imaging. You may withdraw at any time.

Thank you for your consideration in participating in my study. If you have any questions or concerns about your participation in the study or your rights as a research participant, you may contact the chair of the Human Subjects Review Board at BGSU at 419-372-7716 or via email at hsrb@bgsu.edu. You may also contact my project advisor or myself at the following contacts: Dr. Terry Herman, hermant@bgsu.edu 419-372-7265 and Brandon Heiss, heissb@bgsu.edu.

Sincerely,

Brandon Heiss

Please check one of the following options below, and sign. By selecting option 1, you are giving your consent to participate in the study.

_____ Yes, I am willing to participate in this study and have read the preceding material.

_____ No, I do not wish to participate in this study.

Franklin Imaging employee signature ____________________________________
January 22, 2009

TO: Brandon Heiss
    College of Technology

FROM: Hillary Harmen
    HSRD Administrator

RE: HSRD Project No.: H09T152GX2

TITLE: The Effectiveness of Implementing Classroom Response Systems in the Corporate Environment

You have met the conditions for approval for your project involving human subjects. As of January 21, 2009, your project has been granted final approval by the Human Subjects Review Board (HSRB). This approval expires on January 20, 2010. You may proceed with subject recruitment and data collection.

The final approved version of the consent document(s) is attached. Consistent with federal OHRP guidance to IRBs, the consent document(s) bearing the HSRB approval/expiration date stamp is the only valid version and you must use copies of the date-stamped document(s) in obtaining consent from research subjects.

You are responsible to conduct the study as approved by the HSRB and to use only approved forms. If you seek to make any changes in your project activities or procedures (including increases in the number of participants), please send a request for modifications immediately to the HSRB via this office. Please notify me, in writing (fax: 372-6916 or email: hsrb@bgusu.edu) upon completion of your project.

Good luck with your work. Let me know if this office or the HSRB can be of assistance as your project proceeds.

Comments/Modifications: The “clean” stamped consent document is coming via campus mail.

c: Dr. Terry Herman

Research Category: EXEMPT #2
APPENDIX B: TREATMENT GROUP POWERPOINT PRESENTATION

Fire Extinguisher Training

Is your clicker working?
1. Yes
2. No

The Fire Triangle

Fire Safety, at its most basic, is based upon the principle of keeping fuel sources and ignition sources separate.

The Fire Triangle

Three things must be present at the same time to produce fire:
1. Enough OXYGEN to sustain combustion
2. Enough HEAT to reach ignition temperature
3. Some FUEL or combustible material

Together, they produce the CHEMICAL REACTION that is fire.

Take away any of these things and the fire will be extinguished.

Prepared for Franklin Imaging employees - February 4, 2009
Fuel Classifications

- Fires are classified according to the type of fuel that is burning.
- If you use the wrong type of fire extinguisher or the wrong class of fire, you might make matters worse.
- It's very important to understand the four different fire (fuel) classifications.

Which of the following is NOT part of the fire triangle?

1. Fuel
2. Nitrogen
3. Heat
4. Oxygen

Fuel Classifications

- Class A: Wood, paper, cloth, trash, plastics—solids that are not metals.
- Class B: Flammable liquids—gasoline, oil, grease, acetone. Includes flammable gases.
- Class C: Electrical; energized electrical equipment. As long as it's "plugged in."
- Class D: Metals—potassium, sodium, aluminum, magnesium. Requires Metal-X, foam, and other special extinguishing agents.
Types of Fire Extinguishers

1. Water (APW) Fire Extinguishers

- Oxygen (O₂)
- Heat
- Fuel

APW extinguishers are designed for Class A fires only. They are effective on fires involving wood, paper, textiles, and cloth.

- Using water on a Class A fire is effective.
- Using water on an electrical fire increases the risk of electrocution. If you have no choice but to use an APW on an electrical fire, make sure the electrical equipment is unplugged or de-energized.
Types of Fire Extinguishers

1. Water (APW) Fire Extinguishers
   APWs will be found in older buildings, particularly in public hallways.
   They will also be found in computer laboratories. It is important to remember that
   computer equipment must be disconnected from its electrical source before
   using a water extinguisher on it.

2. Carbon Dioxide Fire Extinguishers
   CO₂ is a non-flammable gas that takes away the oxygen element of
   the fire triangle, without oxygen, there is no fire.
   CO₂ is very cold as it comes out of the extinguisher, so it
   can freeze the feet as well.
Types of Fire Extinguishers

2. Carbon Dioxide Fire Extinguishers

CO₂ may be effective in extinguishing a Class A fire because it may not be able to displace enough oxygen to successfully put the fire out.

Class A materials may also smolder and re-ignite.

Types of Fire Extinguishers

3. Dry Chemical (ABC) Fire Extinguishers

 Dry chemical extinguishers put out fire by starving the fuel with a thick layer of dust. This separates the fuel from the oxygen in the air.

The powder also works to interrupt the chemical reaction of fire. These extinguishers are very effective at putting out fire.

Types of Fire Extinguishers

3. Dry Chemical (ABC) Fire Extinguishers

ABC extinguishers are used on a variety of fires. They range in size from 5 to 20 lbs.

"ABC" fire extinguishers are filled with a fine yellow powder. The greatest portion of this powder is composed of monoammonium phosphate. The extinguishers are pressure filled with nitrogen.

Types of Fire Extinguishers

3. Dry Chemical (ABC) Fire Extinguishers

Dry chemical extinguishers come in a variety of types...

You may see them labeled:

- ABC (for "Dry Chemical")
- ABC (can be used on Class A, B, or C fires)
- BC (designed for use on Class B or C fires)
Types of Fire Extinguishers

3. Dry Chemical (ABC) Fire Extinguishers

It is extremely important to identify which types of dry chemical extinguishers are located in your area.

An "ABC" extinguisher will have a label like this, indicating it may be used on Class A, B and C fires.

You don't want to mistakenly use an "ABC" extinguisher on a Class B fire thinking that it was an "ABC" extinguisher.

On campus, you will find ABC's in public hallways of new buildings, laboratories, break rooms, offices, chemical storage areas, mechanics rooms, University vehicles, etc.

What class would a grease fire be considered?

1. Class A
2. Class B
3. Class C
4. Class D

It is safe to use water on an electrical fire

1. True
2. False

Fire Extinguisher Training
What type of fire extinguishers cool down a fire?
1. APW (Air Pressurized Water)
2. CO2 (Carbon Dioxide)
3. ABC (Dry Chemical)

Which type of extinguisher has a hard horn on the end of the hose?
1. APW (Air Pressurized Water)
2. CO2 (Carbon Dioxide)
3. ABC (Dry Chemical)

How to Use a Fire Extinguisher

Pull
Aim
Squeeze
Sweep

How to Use a Fire Extinguisher

Pull the pin—
This will allow you to discharge the extinguisher

Pull the pin
How to Use a Fire Extinguisher

**Aim** at the base of the fire...

- Hit the fuel. If you aim at the flames...
- ...the extinguishing agent will fly right through and do no good.

**Squeeze** the top handle...

- This depresses a button that releases the pressurized extinguishing agent.

How to Use a Fire Extinguisher

**Sweep** from side to side...

- ...until the fire is completely out.

Start using the extinguisher from a safe distance away, then slowly move forward.

Once the fire is out, keep an eye on the area in case it reignites.

Which of the following is NOT part of the acronym P.A.S.S.?

1. Pull
2. Aim
3. Scream
4. Squeeze
5. Sweep

Fire Extinguisher Training
Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:
1. If the fire is spreading rapidly beyond the point where it started, it is not safe to use an extinguisher.
2. If the fire is spreading quickly, it is best to simply evacuate the building.
3. As you exit a building, close doors and windows behind you as you leave. This will help to slow the spread of smoke and fire.
4. Do not fight the fire if:
   - You don’t have adequate or appropriate equipment.
   - You don’t have the correct type or large enough extinguisher.
   - It is not safe to stay near the fire.
   - You might inhale toxic smoke.
   - You don’t have any other resources like water, chemicals, or foam extinguishers.
   - You are uncomfortable with the situation for any reason, just call the fire department to do their job.

Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:
1. Know what is burning. If you don’t know what’s burning, you won’t know what kind of extinguisher to use.
2. Even if you have an ABC extinguisher, there may be something in the fire that is going to explode or produce toxic fumes.
3. Chances are you will know what’s burning, or at least have a pretty good idea, but if you don’t, let the fire department handle it.

Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:
1. Avoid any device that is burning. It is not safe to use any device that is burning.
2. Call 911 or activate the fire alarm. The fire alarm will notify the fire department and other building occupants and shut off the air handling system to prevent the spread of smoke.
3. If the fire is small, you may attempt to use an extinguisher to put it out. However,...

Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:
1. Avoid any device that is burning. It is not safe to use any device that is burning.
2. Call 911 or activate the fire alarm. The fire alarm will notify the fire department and other building occupants and shut off the air handling system to prevent the spread of smoke.
3. If the fire is small, you may attempt to use an extinguisher to put it out. However, ...
Rules for Fighting Fires

The first rule is to always position yourself with an exit or means of escape at your back before you attempt to use an extinguisher to put out a fire.

In case the extinguisher malfunctions, or something unexpected happens, you need to be able to get out quickly. You don’t want to become trapped.
APPENDIX C: CONTROL GROUP POWERPOINT PRESENTATION

Fire Extinguisher Training

Prepared for Franklin Insurance employees. February 4, 2009

The Fire Triangle

Fire safety, at its most basic, is based upon the principle of keeping fuel sources and ignition sources separate.

Fuel Classifications

1. Fires are classified according to the type of fuel that is burning.
2. If you use the wrong type of fire extinguisher on the wrong class of fire, you might make matters worse.
3. It's very important to understand the four different fire (fuel) classifications...

The Fire Triangle

Three things must be present at the same time to produce fire:
1. Enough OXYGEN to sustain combustion
2. Enough HEAT to reach ignition temperature
3. Some FUEL or combustible material

Together, they produce the CHEMICAL REACTION that is fire.

Take away any of these things and the fire will be extinguished.
**Fuel Classifications**

1. **Class A**: Wood, paper, cloth, trash, plastics—items that are not metals.
2. **Class B**: Flammable liquids—gasoline, oil, grease, acetone. Includes flammable gases.
3. **Class C**: Electrical—energized electrical equipment. As long as it is "plugged in."
4. **Class D**: Metals—potassium, sodium, aluminum, magnesium. Requires metal, X, foam, and other special extinguishing agents.

**Fuel Classifications**

Most fire extinguishers will have a pictograph label telling you which types of fire the extinguisher is designed to fight.

For example, a simple water extinguisher might have a label like this...

...which means it should only be used on Class A fires.

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**Types of Fire Extinguishers**

Different types of fire extinguishers are designed to fight different classes of fire.

The 3 most common types of fire extinguishers are:

1. Water (APW)
2. Carbon Dioxide (CO₂)
3. Dry Chemical (ABC, BC, DC)

**Types of Fire Extinguishers**

1. **Water (APW) Fire Extinguishers**

   - Large size fire extinguishers that stand about 2 feet tall and weigh about 15 pounds when full.
   - Also stands for "Air Pressured Water."
   - Filled with ordinary tap water and pressurized air; they are effective on large open areas.
Types of Fire Extinguishers

1. Water (APW) Fire Extinguishers
   - Are designed for Class A fires only.
   - Using water on a flammable liquid fire could cause the fire to spread.
   - Using water on an electrical fire increases the risk of electrocution. If you have no choice but to use an APW on an electrical fire, make sure the electrical equipment is unplugged or de-energized.

2. Carbon Dioxide (CO2) Fire Extinguishers
   - CO2 extinguishers are red. They range in size from 5 lbs to 100 lbs or larger. On larger areas, the fire will be at the end of a long, flexible hose.
**Types of Fire Extinguishers**

2. **Carbon Dioxide Fire Extinguishers**

- CO₂ is a non-flammable gas that takes away the oxygen essential for combustion. Without oxygen, there is no fire.
- CO₂ is very cold as it comes out of the extinguisher, so it cools the fuel as well.

### Diagram

**Dry Chemical (ABC) Fire Extinguishers**

- Dry chemical extinguishers work by cutting off the oxygen supply to the fire. They are very effective at putting out fires.
3. Dry Chemical (ABC) Fire Extinguishers

ABC extinguishers are red. On campus, they range in size from 5 to 20 lbs.

"ABC" fire extinguishers are filled with a fine yellow powder. The most popular of this powder is ammonium phosphate. The extinguishers are pressurized with nitrogen.

Types of Fire Extinguishers

You may see them labeled:
- DC (for "Dry Chemical")
- ABC can be used on Class A, B, or C fires
- DC is designed for use on Class A and C fires

Dry chemical extinguishers are filled with powder designed for Class B and C fires. "DC" extinguishers are commonly located in places such as commercial kitchens and areas with flammable liquids.

On campus, you will find ABC's in public halls, areas of new buildings, laboratories, break rooms, etc. Chemical storage areas, mechanical rooms, University vehicles, etc.
How to Use a Fire Extinguisher

PULL
- Pull
- Aim
- Squeeze
- Sweep

This will allow you to discharge the extinguisher.

Pull the pin...

Aim at the base of the fire...

Hit the fuel. If you aim at the flames...

...the extinguishing agent will fly right through and do no good.

Squeeze the top handle...

This depresses a button that releases the pressurized extinguishing agent.
How to Use a Fire Extinguisher

Sweep from side to side...

... until the fire is completely out.

Start using the extinguisher from a safe distance away, then slowly move toward.

Once the fire is out, keep an eye on the area in case it re-ignites.

Rules for Fighting Fires

Fire can be very dangerous and you should always be certain that you will not endanger yourself or others while attempting to put out a fire.

For this reason, when a fire is discovered...

1. Avoid any person in immediate danger of injury. If it can be accomplished without risk to yourself.
2. Call 911 or activate the building fire alarm. The alarm will notify the fire department and other building occupants and shut off the air handling system to prevent the spread of smoke.

If the fire is small and only after having done these 2 things, you may attempt to use an extinguisher to put it out. However...

Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:

1. Know what you are fighting. If you don't know what's burning, you won't know what kind of extinguisher to use.
2. Even if you have an ABC fire extinguisher, there may be warning signs on the fire that is going to explode or produce toxic fumes.

Chances are you will know what's burning, or at least have a pretty good idea, but if you don't, let the fire department handle it.

Rules for Fighting Fires

... before deciding to fight the fire, keep these things in mind:

3. If the fire spreads rapidly beyond the point where it started! The time is now as extinguisher is at the beginning stage of the fire.
4. If the fire is already spreading quickly, it is best to simply evacuate the building.

At any cost, never attempt to fight a fire from within a building where you are not familiar with the layout. This will help to slow the spread of smoke and fire.
Rules for Fighting Fires

Do not fight the fire if:

✓ You don't have adequate or appropriate equipment; or you don't have the correct type of fire extinguisher to use.
✓ You don't have the correct type of fire extinguisher to use.
✓ You don't have the correct type of fire extinguisher to use.
✓ Your instinct tells you not to. If you are uncomfortable with the situation for any reason, just let the fire department do their job.

The final rule is to always position yourself with an exit or means of escape at your back before you attempt to use an extinguisher to put out a fire.

In case the extinguisher explodes, or something unexpected happens, you need to be able to get out quickly. You don't want to become trapped.
APPENDIX D: CONTROL AND TREATMENT GROUPS PRE-TEST

Fire Extinguisher Training
Franklin Imaging
Pre-test

Group: B

1. An example of two “Class B” fuels would be:
   _____ Cardboard, Newspapers
   _____ Lamp, Hot Plate
   _____ Grease, Paint Thinner

2. An APW (Water extinguisher) is safe to use on an electrical fire.
   _____ True
   _____ False

3. Carbon Dioxide Extinguishers are designed for which types of fuels?
   _____ Class B and C
   _____ Class A, B, and C
   _____ Class A and C
   _____ Class A and B

4. Which type of extinguisher has a hard horn on the end of a flexible hose or metal arm?
   _____ APW (Air Pressurized Water)
   _____ CO2 (Carbon Dioxide)
   _____ ABC (Dry Chemical)

5. As a general rule, you should not attempt to fight a fire if it is spreading rapidly.
   _____ True
   _____ False

6. ABC fire extinguishers extinguish fire by cooling it down.
7. Water will not extinguish most flammable liquid fires.
   _____ True
   _____ False

8. You should always keep an exit or means of escape at your back when trying to fight a fire.
   _____ True
   _____ False

9. The three elements of the fire triangle are:
   _____ Water, A heat source, Fuel
   _____ Oxygen, Water, and Fuel
   _____ Oxygen, Fuel, and A heat source
   _____ Fuel, Oxygen, and Hydrogen

10. What does the acronym P.A.S.S. stand for? (4 Points)
    P
    A
    S
    S

11. Do you know where the nearest fire extinguisher is in your work area?
    _____ Yes
    _____ No
APPENDIX E: TREATMENT GROUP POST-TEST

Fire Extinguisher Training
Franklin Imaging
Post-test

Group: A

1. An example of two “Class B” fuels would be:
   ____ Cardboard, Newspapers
   ____ Lamp, Hot Plate
   ____ Grease, Paint Thinner

2. An APW (Water extinguisher) is safe to use on an electrical fire.
   ____ True
   ____ False

3. Carbon Dioxide Extinguishers are designed for which types of fuels?
   ____ Class B and C
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4. Which type of extinguisher has a hard horn on the end of a flexible hose or metal arm?
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11. Do you know where the nearest fire extinguisher is in your work area?
    _____ Yes
    _____ No

Delivery of Training Survey:
Please circle the best answer for each question.

1.) Today’s training seminar was informative.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly disagree

2.) The interaction and use of technology between the user and the audience was innovative.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly disagree

3.) The technology used today was easy to understand.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly disagree

4.) The technology used today kept my attention throughout the presentation.
   a. Strongly agree
   b. Agree
   c. Neither agrees nor disagrees
   d. Disagree
   e. Strongly disagree
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