GRIFFIN, BRUCE D., Ph.D. Effective Fire Safety Education for Residential Students. (2011)
Directed by Dr. Deborah J. Taub. 91 pp.

Fire safety for residential students is a concern to campus housing administrators, campus environmental health and safety professionals, local fire departments, and parents. Training and educating students is often a major component of a campus fire safety program, though little research has considered its effectiveness. Millennial students have unique characteristics that may impact how they respond to various methods of fire safety education. This purpose of this study was to determine whether peer educators or authority figures have a greater impact on safety behaviors following initial fire safety training. Further, the study was to determine if adding experiential learning techniques to the traditional fire safety lecture would have a greater influence on safety behavior. Specifically, the behaviors of exiting the residence hall when the alarm sounds and knowing two exits were measured. Effectiveness was measured by predicting the safety behaviors using principles of the Theory of Planned Behavior (TPB). The Residential Student Fire Safety Behavior Survey (RSFSBS) was created to measure the four dimensions of the TPB, generalized intention to perform the behavior, the students' attitudes about the behavior, their feelings about how normal the behavior is (subjective norm), and their perceived control over performing the behavior. The findings from this research suggest that neither intervention proved more effective than the other. They did suggest that residential students' subjective norms related to fire safety vary more than the other dimensions and that this might be an area to address to improve student fire safety behavior.

EFFECTIVE FIRE SAFETY EDUCATION

FOR RESIDENTIAL STUDENTS

by

Bruce D. Griffin

A Dissertation Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements of the Degree
Doctor of Philosophy

Greensboro
2011

Approved by

Deborah J. Taub
Committee Chair

To my wife, Jennifer and son, Keen,

Your love, understanding, expectations, and sacrifices allowed us to do this.

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair _____

Committee Members _____

_____

_____

_____
Date of Acceptance by Committee

_____
Date of Final Oral Examination

ACKNOWLEDGMENTS

I would like to thank my committee chair, Dr. Deborah J. Taub for her guidance, spirit, and expertise throughout the dissertation process. Her knowledge and ability to offer the right advice at the right time proved to be uncanny. I give special thanks to the following committee members: to Dr. David Ayers for always forcing me to challenge my assumptions by asking hard questions; to Dr. Mary Hummel for giving me new insights into the student housing profession; and to Dr. David Batts for being a friend and for his faith in me.

I could not have completed this degree without the support and flexibility of all of my colleagues at UNCG, especially in Housing and Residence Life, Environmental Health and Safety, and Enterprise Risk Management. A special thanks to all of the Greensboro firefighters at Stations 4 and 5, the Residence Life Staff in the high rises, Jim Boggs, Megan Delph, and the residence hall students.

Additionally, I would like to thank my parents and brothers for modeling hard work and keeping a watch over me. My second mother, Ruth, for keeping me grounded, transcribing when needed, and editing every draft. My son, Keen, for always coming to my office with me when I had work to do or giving me a hug when I got home late. Finally, I would like to acknowledge my beautiful wife, Jennifer, for her love, patience, and support throughout this journey. Thank you for the sacrifice of our time together and for making sure Keen got to practice so that I could study or write. This dissertation is dedicated to you.

TABLE OF CONTENTS

Page

LIST OF TABLES vii

CHAPTER

I. INTRODUCTION 1

Statement of the Problem 1
Significance of the Study 5
Conceptual and Theoretical Frameworks 6
Millennial Generation Characteristics and Learning Styles 6
Theory of Planned Behavior (TPB) 8
Purpose of the Study 9

II. REVIEW OF LITERATURE 11

Introduction 11
Campus Fire Safety Research 11
Fire Safety Learning Experience Content 18
Millennial Students 24
Millennial Generation Characteristics and Learning Styles 24
Millennial Students Peer and Non-Peer Learning 28
Millennial Students and Experiential Learning 29
Application of Theory of Planned Behavior 32

III. METHODOLOGY 34

Introduction 34
Participants 35
Instrument 35
Residential Student Fire Safety Behavior Survey 35
Pilot Study Participants 36
Reliability 37
Validity 44
Procedures 46
Analysis 48
Limitations 48

IV. RESULTS 49

Introduction 49
Descriptive Statistics 49
Confirmatory Factor Analysis 53
Estimate of Reliability 55
Comparison of Mean Total Scores 57
Factorial Analysis of Variance 59
Additional Analysis 61

V. DISCUSSION 63

Introduction 63
Findings 65
Preliminary Analysis 65
Research Question Analysis 66
Combination Analysis 67
Additional Analysis 68
Limitations 68
Implications for Practice 70
Implications for Future Research 71
Conclusion 73

REFERENCES 75

APPENDIX A. THE PILOT RESIDENTIAL STUDENT FIRE SAFETY BEHAVIOR SURVEY INSTRUMENT 83

APPENDIX B. THE RESIDENTIAL STUDENT FIRE SAFETY BEHAVIOR SURVEY INSTRUMENT 85

APPENDIX C. OUTLINE FOR FIRE SAFETY TRAINING AT FIRST FLOOR MEETING—LECTURE ONLY 87

APPENDIX D. OUTLINE FOR FIRE SAFETY TRAINING AT FIRST FLOOR MEETING—EXPERIENTIAL LEARNING TECHNIQUES 89

LIST OF TABLES

Page

Table 1. RSFSBS Pilot Study Generalized Intention Reliability Statistics 38

Table 2. RSFSBS Pilot Study Generalized Intention Item—Total Statistics 38

Table 3. RSFSBS Pilot Study Attitude toward Behavior Reliability Statistics 39

Table 4. RSFSBS Pilot Study Attitude toward Behavior Item-Total Statistics 39

Table 5. RSFSBS Pilot Study Subjective Norms Reliability Statistics 41

Table 6. RSFSBS Pilot Study Subjective Norms Item-Total Statistics 41

Table 7. RSFSBS Pilot Study Subjective Norms Reliability Statistics with Items 1 and 6 Removed 42

Table 8. RSFSBS Pilot Study Subjective Norms Item-Total Statistics with Items 16 and 21 Removed 42

Table 9. RSFSBS Pilot Study Perceived Behavioral Control Reliability Statistics 43

Table 10. RSFSBS Pilot Perceived Behavioral Control Item-Total Statistics 43

Table 11. RSFSBS Pilot Subjective Norm Dimension Item Statistics 45

Table 12. Frequencies and Percentiles of Sample Population Demographics 51

Table 13. Frequencies and Percentiles of Intervention Types 52

Table 14. Total Variance Explained: Principal Component Analysis 54

Table 15. Component Matrix: Principal Component Analysis 54

Table 16. Reliability Analysis 56

Table 17. Descriptive Statistics of RSFSBS Total Score 58

Table 18. Independent Samples Test RSFSBS Total Score (Peer Educator vs. Authority Figure) 58

Table 19. Descriptive Statistics of RSFSBS Total Score 59

Table 20. Independent Samples Test RSFSBS Total Score (Lecture Only vs. Experiential Learning) 59

Table 21. Descriptive Statistics of RSFSBS Total Score 60

Table 22. One Way Analysis of Variance (ANOVA) of RSFSBS Total Score 61

Table 23. Descriptive Statistics of RSFSBS Total Score 61

Table 24. Independent Samples Test RSFSBS Total Score (Male vs. Female) 62

CHAPTER I

INTRODUCTION

Statement of the Problem

Since January 2000, 146 people have died in the United States in campus fires (Campus Firewatch, 2011). These fires include those occurring in off-campus housing, as well as on-campus. The U.S. Fire Administration (U.S. Department of Homeland Security, Federal Emergency Management, 2009) estimates that over 3,800 fires occur each year in university owned housing on campus, with 23% of these fires occurring at the traditional start of the school year in the months of September and October. The U.S. Fire Administration also estimates that five fatalities occur as a result of on-campus housing fires each year. When a fatality occurs on a college campus the impacts can be very severe to the student body, a relatively homogenous population being of similar age and experience (Taub & Servaty-Seib, 2008). Impacts extend beyond the campus, as many parents of college students are very involved with their children in college and will react to the tragedy whether it involves their child or someone else's (Taub, 2008). In addition, government bodies representing these parents have reacted with attempts to improve fire safety for college students through regulation and reporting (Farrell, 2005).

Preventing the tragedy suffered by each family and each learning community involves addressing several aspects of life on campus. There are four key elements to any effort aimed at providing fire safe student housing (Mowrer, 1999). These elements are

summarized with the acronym PODS; which includes prevention, occupant awareness and training, detection and alarm, and suppression. Prevention activities include using fire safe interior finishes and furnishings while reducing ignition sources such as smoking, candles, cooking, and faulty electrical appliances. Prevention activities can only reduce the number of fires, as it is not practical to remove all of the hazards, so other elements must be part of a fire safe student housing program (Mowrer, 1999). The second element, occupant awareness and training, offers the opportunity to educate students about prevention activities in which they can participate and what actions they can take in response to a fire. Mowrer's brief description of this activity primarily focuses on the content of training; effective delivery methods are not mentioned. His treatment of the detection, alarm, and suppression elements of PODS all relate to the engineering controls aimed at reducing the severity of fires after they occur in university housing. In the health and safety profession, engineering controls are one of three ways to control a hazard; the other two less desirable methods are administrative controls and personal protective equipment (Raterman, 1996).

Requiring fire safety education has been part of various campus fire safety acts introduced into Congress following a fatal fire at Seton Hall University in 2000. However, the effectiveness of fire prevention and response training and education efforts for college students has not been explored in great depth. Recently, with the 2008 signing of the Higher Education Opportunity Act (HEOA), fire safety improvements are beginning to receive national regulatory attention. For instance, fire safety provisions of the HEOA require campuses to maintain a log of both fire alarms and false alarms in

university owned housing, along with compiling an annual report with information about fire safety items related to student housing facilities. One of the provisions of both pieces of legislation, the previously proposed and the enacted, is the reporting of information concerning residential fire safety education to students, parents, and to the United States Department of Education. The enactment of HEOA places new emphasis on the quality of fire safety learning experiences for residential students. Therefore, understanding which types of learning experiences are most effective at teaching and motivating students to choose fire safe behaviors, could assist universities in making their responses to the requirements meaningful, cost-effective, and more beneficial to the student participants.

College students in the United States face a variety of safety and health hazards while they pursue their education. Much publicity surrounded the events of April 16, 2007, when a college student at Virginia Tech began shooting fellow students, resulting in the death of 27 students. This type of mass shooting event is very rare on a college campus, as is murder in general. However, considerable media attention, government investigations, and new resources have been introduced to prevent these tragedies. The latest U.S. Department of Education (2009) statistics indicate that in the period from 2001 to 2007, 108 murders, including the 27 killed at Virginia Tech, have occurred on college campuses. For the years statistics are available, an average of 15.4 campus murders occur each year. If the unusual event at Virginia Tech is not included, the average drops to just over 10 per year. In contrast, during the same period, over 6,000 arsons were reported to the Department of Education. Campus Firewatch (2011) indicates

that 146 fire deaths have occurred between 2000 and 2010, for an average of 15 per year. *University Housing Fires* (U.S. Department of Homeland Security, 2009) looks at the years 2005 to 2007, and indicates that an average of 5 deaths, 50 injuries, and $26 million in property loss occurs in on-campus housing fires each year. By comparison, it is possible to make the argument that campus fires should be given at least the same resource and media attention as campus shootings.

Two specific events revealed the importance of effective fire safety training to this researcher. The first was the apparent incongruity of my first experience with fire safety training for residential students. Ironically, it was not as a residential student, although I had lived in a residence hall my first two years in college; it was as an undergraduate fire safety inspector at the University of Maryland. Annual fire drills were conducted at each residence hall near the beginning of the school year. I was assisting a full-time staff member with this effort. When we came to my former residence hall, I was asked to give a brief lecture after the students had evacuated the building with the fire alarm sounding. The assignment struck me as odd; I had nothing prepared to say, I had never received instruction on effective education techniques, and the setting was unusual, the front porch of my old dorm. At the time, I was studying B. F. Skinner and operant conditioning and thought about how the students had behaved properly and evacuated the building. Then they were confronted with what I imagine was negative reinforcement, me standing on a bench telling them to be sure to leave the building the next time the alarm sounded, as it could be a real fire. For years, this negative reinforcement concept stuck

with me and I always hoped that any training in which I was a part would be based on sound techniques to make it effective and possibly even welcomed.

Student fire deaths occurring only a few blocks from my office was the second event that caused me to look further into ways to prevent this type of tragedy. In 2002, two students from the University of North Carolina at Greensboro and one from Greensboro College died in a fire in an off-campus apartment (Campus Firewatch, 2011). This event led this researcher to explore the existing research into effective fire safety education for college students in order to determine how to prevent future fatalities. The campus had previously concentrated its fire safety programs on improving fire protection systems and prevention activities for its on-campus housing. This event made it apparent that such efforts were not sufficient to prevent the tragedy of a student fatality from occurring in the university community. More effective training and education might have played a role in preventing these deaths by arming students with prevention knowledge, response actions, and a better understanding of the importance of fire protection systems in their residences, both on and off campus.

Significance of the Study

In a review of the literature about fire and life safety education in the higher education setting, little peer-reviewed research exists. In one directly related study, Barrows and Thurman (1988) tried to determine if student self-perception of knowledge about fire and life safety had a relationship to their actual knowledge. Their conclusions were that college students perceive higher levels of fire safety knowledge than they actually have and that this may lead to more risk taking, as they believe risk levels to be

lower than they are. Barrows and Thurman also suggested a need for more education, in addition to making facilities inherently safer for student occupants. Finally, Barrows and Thurman suggested that more research is needed to determine what could improve student fire safety knowledge, but little has been done since this 1988 effort.

Mowrer's (1999) *Fire Safe Student Housing: A Guide for Campus Housing Administrators* developed a four-element PODS program aimed at creating fire safe university housing. Mowrer laid a foundation by developing a framework, but did not explore each of the four topics in further detail. Email correspondence (F. W. Mowrer, personal communication, April 27, 2009) indicated that Mowrer has not pursued further research involving fire safety at university campuses. This lack of research, compared to other health and safety topics, may be related to the fact that fire safety researchers seem to focus on modeling fire behavior, modeling human behavior during fires, and developing effective suppression systems.

Conceptual and Theoretical Frameworks

Millennial Generation Characteristics and Learning Styles

Although my review uncovered little information about fire and life safety education in the higher education setting, there were a few studies concerning effective education techniques in learning experiences incorporating methods appealing to today's traditional age college students. These students are part of a generation called Millennials (Howe & Strauss, 2000). This generation, born since 1982, has unique characteristics as a result of the environment in which they have come of age and many believe these influence their learning styles. Howe and Strauss (2007) stress Millennials have seven

core traits: these are special, sheltered, confident, team-oriented, conventional, pressured, and achieving. These traits are used to define them as a generation and also describe how they interact with their college learning environments.

Newton and Ender (2010) believe that peer educators are effective "because of shared experiences that permit a connection to the student's situation and a feeling of ease in talking with a peer" (p. 31). However, the conventional nature of this generation and their respect for traditional figures of authority might challenge research supporting the effectiveness of peer education, especially related to changing positive health behaviors. There is no research that shows which type of educator might be more effective for fire safety learning experiences.

The use of experiential learning techniques is also one of the elements whose impact on the effectiveness of the fire safety learning experience will be measured. Junco (2007) suggests that Millennials prefer social interaction in their learning experiences and experiential learning environments benefit these learners. Oblinger (2003) confirms experiential learning as a learning preference of Millennials:

> Along with differences in attitudes, Millennials exhibit distinct learning styles. For example, their learning preferences tend toward teamwork, experiential activities, structure, and the use of technology. Their strengths include multitasking, goal orientation, positive attitudes, and a collaborative style. (p. 2)

Simulations of real life experiences engage Millennial generation learners and better prepare them to react to real scenarios when they are encountered (Skiba & Barton, 2006).

Theory of Planned Behavior (TPB)

Changing unhealthy or unsafe behaviors is a complex task and not fully understood. Nonetheless, the Theory of Planned Behavior (TPB) (Ajzen, 1991) postulates that two person related factors offer primary predictors of future behavior. These factors are an intention to perform the behavior (behavioral beliefs) and a perceived control of or ability to perform the behavior (control beliefs). Ajzen (2006) expanded the theory over time to include a third factor, that the subject should have a belief that the behavior is normal and expected in the given situation in order to influence its performance (normative beliefs). According to Ajzen (2006), simply having the knowledge of a healthy or safe behavior does not appear to be sufficient to influence behavior and that these other three factors are required to influence an individual's behavior. Therefore, simply measuring knowledge or perceived knowledge is not a good measure of potential behavior change as a result of a safety education program.

In further investigation, Armitage and Conner (2001), in a meta-analysis of 185 independent, published studies of TPB supported this initial theory and provided suggestions to improve future research. At least 88 of the studies were related to health behavior interventions and some were specific to college student populations, although none was specific to fire safety. Therefore, this study will expand upon previous research by using the TPB to determine which fire safe educational methods possibly contribute to desired behavioral changes by measuring students' beliefs after an educational intervention.

In sum, the desired outcome of this study, while possibly informing theory development and policy on some level, is to influence practice on college campuses. Expected outcomes of the research are to inform fire safety educators about how to make their efforts effective at changing behaviors and possibly a little more important in the minds of the student participants. Campus housing administrators, campus environmental health and safety professionals, local fire departments, Greek life administrators, and Greek organization risk management officers will be very interested in the outcomes of this work, as it may inform their efforts to develop effective strategies, including education, to reduce the loss of life caused by campus fires. In doing so, they are better able to meet the spirit of the new fire safety reporting regulations that are part of the 2008 Higher Education Opportunity Act.

Purpose of the Study

Little peer-reviewed research is available on campus fire safety education to guide higher education professionals in the development and presentation of fire safety education to college students. As a result, most campus fire safety education programs are not grounded in the research literature. Furthermore, recent fires resulting in fatalities point to the ineffectiveness of current campus-based efforts. Fire safety literature emphasizes the need to educate students about appropriate behavior before and during fire emergencies and discuss the information that is important for students to learn.

Given that Millennial students are the primary focus of the learning experiences, their unique characteristics will inform the instructional methods. This will include examining whether their desire to follow authority figures will improve learning. The

inclusion of experiential learning activities, which should also appeal to this generation, will also influence the learning experience and outcome.

The purpose of this study is to identify teaching methods that influence students to choose safer behaviors related to fire safety during their college careers. Success will be determined by predicting behavior change using the Theory of Planned Behavior (Ajzen, 1991). Whether the educational experience is able to influence fire safety behaviors will be explored by measuring the students' generalized intention to perform the safer behaviors, their attitudes toward the behaviors, their perceived ability to control the behaviors, and how normal they believe the behaviors to be. The following are the research questions:

1. Is there a significant difference in the intention to perform fire safe behaviors between students who participate in a formal fire safety learning experience led by a peer educator and students who participated in the same formal fire safety learning experience led by an authority figure?
2. Is there a significant difference in the intention to perform fire safe behaviors between students who participate in a formal fire safety learning experience that includes an experiential learning component and students who participated in the same formal fire safety learning experience that did not include the experiential educational component?

CHAPTER II

REVIEW OF LITERATURE

Introduction

In this chapter, literature concerning campus fire safety, fire safety learning experience content, Millennial students, and the theory of planned behavior are reviewed in the context of proposing effective fire safety learning experiences for residential college students.

Campus Fire Safety Research

Very little campus fire safety research has been published in peer reviewed journals. One of the few studies explored whether college student self-perception of knowledge about fire and life safety was related to the students' actual knowledge (Barrows & Thurman, 1988). The researchers conducted a telephone survey of 467 college students and inquired how well informed students felt they were about fire safety (dependent variable) compared to their actual knowledge, past fire experience, level of fear of fire, fire education, gender, and knowledge prior to arriving on campus. General study findings indicated that college students perceived higher levels of fire safety knowledge than they actually possessed and that this may lead to more risk taking, as they believed risk levels to be low. For instance, students' lack of actual knowledge was evident, as "only 23 percent know the correct telephone number to dial in the event of a fire emergency" (p. 312). So, whereas many indicated they knew what to do in a fire

(perceived knowledge), in fact they did not even know the emergency phone number to dial in the event of a fire. As an implication of the study, Barrows and Thurman (1988) argue that "stricter measures should be taken to both educate, and ultimately protect, the student population" (p. 312), although the researchers offered no suggestions for accomplishing this task. Barrows and Thurman also called for more research to determine what could improve college students' fire safety knowledge, but little has been done since this 1988 effort.

Over the years, there has been limited response to this call to action. The work of Frederick Mowrer, a fire protection engineering professor at the University of Maryland, who developed the U.S. Fire Administration Report (1999), *Fire Safe Student Housing: A Guide for Campus Housing Administrators*, is one of the few responses. It advised that fire safe on-campus housing has four elements: prevention, occupant awareness and training, detection and alarm, and suppression. This was referred to as the PODS program, an acronym created from each of the four elements and using the word pod's meaning of a protected living environment. The fire prevention elements of PODS are focused on removing one of the three legs of the fire triangle. Mowrer uses the fire triangle as a simple model to show that fire needs three elements to occur and by removing one of them a fire will be prevented. The three elements are fuel, oxygen, and an ignition source. It should be noted that the fire tetrahedron model that adds a fourth element that must be present in order for fire to continue, has superseded the simple model of the fire triangle. This fourth element is the chemical oxidation reaction that occurs during a fire, but this is only important when developing suppression techniques

and does not play a major role in prevention activities. In prevention efforts, air is assumed to be always present as a source of oxygen so it is not an area of focus. Some suppression technologies remove oxygen from the triangle to extinguish fires. Prevention focuses on removing either ignition sources or fuel from the triangle in order to prevent fires from starting. Fuel sources that can be removed to prevent fires include combustible furnishings, combustible wall coverings and paneling, refuse, and paper products. Combustible materials can be chemically treated to reduce their ability to burn rapidly. Reducing or removing ignition sources in order to prevent fires from starting include, smoking materials, candles and open flames, cooking appliances, and faulty or inappropriate electrical appliances.

Furthermore, Mowrer (1999) states that “it (is) clear that the complete elimination or control of potential fuels and ignition sources is not practical” (p. 13). An extension of this stance is that prevention techniques alone are not sufficient to prevent fire. As a result other efforts are needed, including occupant awareness training.

Mowrer (1999) focused his brief discussion about fire safety education (occupant awareness and training) on fire prevention training and fire response training. According to Mowrer, the content of appropriate fire prevention training includes recognition of potential ignition sources and hazardous situations that might be present. Mowrer covered fire response training in detail, including the decision process as to whether an occupant should fight a fire or flee it, fire behavior including the flashover phenomenon, and how the fire protection systems in a building will react. Flashover is a very hazardous situation when the air in a room that has contents on fire becomes superheated and then almost

spontaneously ignites the room's entire contents. Mowrer (1999) did not offer any education techniques and only mentioned practicing evacuation behavior with occupants when he stated that students should be taught two ways of escape from their living environment.

Mowrer's (1999) third element in PODS was detection and alarm which pertained to smoke detection and fire alarm system technologies. The primary reason for these systems is to provide fire and smoke detection leading to early warning to occupants of a hazardous situation. The limitation of these systems is that they work primarily with fires that are slow developing and confined so that if occupants heed the warning they are able to safely avoid the hazards of the fire. The possibilities of occupants not heeding the warning or facing a fire that is spreading rapidly are both weaknesses of these systems and suggest that automatic fire suppression is a desirable addition. Usually, this is primarily the addition of an automatic fire sprinkler system. Finally, Mowrer (1999) discussed the fourth element of fire suppression systems in great detail. It was the largest section of the publication. Fire sprinklers were the most discussed type of fire suppression system.

A ten year review of the American College and University Housing Officer-International (ACUHO-I) library yielded only three relevant presentations from ACUHO-I conferences and three articles from "non-academic" sources (E. Glenn, personal communication, July 14, 2009). The three presentations entitled, *New Approaches to Fire Safety Training* (Longcore & Rossiter, 2008), *Life Safety Networks—A Parallel Network Approach*, (Matthew, 2007) and *General Safety in Residence Hall Buildings*

(Shervington, 2008) did not contain references to literature and appeared to have been more anecdotal. Longcore and Rossiter (2008) provide an overview of the New York State Fire Safety Act, showing that fires do occur from common behaviors, such as decorating halls with combustible materials, improperly disposing of smoking materials, and having candles in sleeping areas. They also provided the Fire Safety Template for Floor Meetings used at Syracuse University which provides insight into the fire safety education contents at a large university. It includes a description of the fire protection systems in the residence halls, including how they operate and how to avoid tampering with them. However, most of the content consists of a review of fire prevention activities that the university pursued, as well as the prevention activities expected of the residents, including rules. Expected fire response behaviors were addressed at the conclusion of the template. Again, a major shortcoming is that the template did not include any information about how to effectively deliver the information.

Matthew's 2007 presentation focused on the installation of security services into the network communication system used to connect a building fire alarm (life safety) system to the police or fire department. Specifically, it focused experiences at the University of Washington in St. Louis and described the technical aspects of making the various systems work together. Shervington's (2008) presentation to the 2008 ACUHO-I annual meeting included prohibitive rules in support of fire prevention and detailed information about flammable decorative materials. It also briefly presented the fire response information that Appalachian State University presented to it residential

students. Similar to the aforementioned works, it only addressed the content, not the presentation style or delivery techniques used.

Two of only three articles found were from the trade publication *College Planning and Management*. This is not a peer-reviewed journal. In the first, Milshtein (2008) interviewed Michael Halligan, Associate Director of Environmental Health and Safety at the University of Utah and Peter Babigian, a principal at WB Engineers. The article offered their insights and personal experiences concerning fire safety education on college campuses. Both provided wide reaching suggestions that included awareness campaigns and "smarter" alarms systems that can connect to personal communication devices. One suggestion from Halligan was that face-to-face education should be conducted by younger firefighters as this "turns a lecture into a peer to peer discussion that students may be more open to" (para. 4). The second article, "How to Prevent On- and Off- Campus Fires" (2005) restated the contents of the American Society of Safety Engineers (ASSE) Fire Protection Practice Specialty (PS) online pamphlet "How to Prevent On/Off-Campus Fires, ASSE Fact Sheet 2" (2009). This information will be discussed subsequently, along with other electronic pamphlets revised in September 2009 by ASSE Fire Protection PS.

The third article found was from a trade publication *American School and University*; in it Kennedy (2007) summarized recommendations from the U.S. Fire Administration electronic one-page pamphlet entitled "Fire Safety 101: A factsheet for colleges and universities" (2006). This included prevention information such as not to overload electrical outlets, use cooking equipment properly, and understand and obey fire

alarm warnings. The pamphlet also noted, “there is a strong link between alcohol and fire deaths” (para. 3), but did not cite a source for this information. Although each of these articles offers information about fire safety for college campuses, the information is anecdotal and based on personal experience and recommendations from committees or groups, and moreover, has not been validated by empirical measures or consistently collected and analyzed using research methodologies.

Additional information at ACUHO-I meetings has been presented since Glenn’s review in the summer of 2009. *Only You Can Prevent Campus Fires: Interactive Fire Safety Training for RAs and Residents* (Francis, Siditsky, Bealafeld, & Clark, 2009) and *Life Safety for On and Off Campus Housing Can You Afford It? How Can You Not?* (Monikowski & Gray, 2009) also appear largely anecdotal. Francis et al. (2009) gave a review of recent fire safety training efforts at George Mason University that included details about their Resident Assistant (RA) Fire Academy developed with the Fairfax County Fire Department. It reviewed their residential student fire safety programming effort, which focused on an interactive Life Safety Fair. This event promoted fire safety by exposing participating students to a variety of fire safety related exhibits. These exhibits included fire extinguisher training, a smoke filled trailer walkthrough, access to fire department equipment, and a controlled room burn, in effort to raise awareness of the residential population. However, no information about how many of the 4,800 residential students participated or if the event had a positive effect was presented. It must also be noted there could be a potential conflict of interest. Monikowski and Gray (2009) presented information about the efficiency of the fire protection systems manufactured

and installed by Simplex-Grinell, a leading fire alarm manufacturer. They are both employees of this company and this presentation appeared to be a sales-pitch for adding fire protection systems to residence halls. Neither presentation contained any references or citations giving the appearance that their recommendations were based primarily on personal experiences.

Furthermore, Ta, Frattaroli, Bergen, and Gielen (2006) conducted a literature review of all fire safety interventions published between 1998 and 2004 and of the 15, did not find any related to campus or university fire safety. In their conclusions, they note that fire department personnel were involved in successful programs, but admit that this was not tested as part of any of the experimental designs. It is also important that this review reiterates criticisms of much older reviews that called for "evaluations that will inform fire injury prevention efforts, and ideally such evaluations will utilize randomized, controlled studies" (p. 195).

Finally, my review of the professional publications and program books of professional development conferences presentations reveals little evidence of empirical research or peer review articles and presentations related to campus fire safety or related educational experiences. Many campus fire safety professionals seem largely informed by past practices and fire safety information developed for delivery to the larger community or specifically to young children.

Fire Safety Learning Experience Content

Fire safety content or information being delivered to residential college students is not covered specifically in any publication. Mowrer (1999) discussed two broad areas for

content about fire safety education fire prevention topics and fire response topics. Fire prevention topics focus on behaviors or information that students can use to prevent fires from occurring. This might include information such as do not use frayed extension cords, do not smoke in bed, or always watch food cooking on the stove. Topics related to response are those that involve planning for and acting during a fire. This information could offer suggestions such as always know two ways out of your building, do not open doors before checking for heat, or know how to activate the fire alarm. Using these two areas for a framework does not cover all potential topics and Mowrer did not specifically address items such as the importance of choosing a residence with a fire sprinkler system or noncombustible egress. Although these would not prevent a fire, they might prevent a fire fatality, so they will be grouped with fire prevention topics. No other specific content suggestions for residential student fire safety education have been found in the literature, unless one considers fatality causes to determine which behaviors are leading to fires and to fatalities.

Mowrer's (1999) research was informed by an examination and analysis of selected college fires (included as an appendix to the report) by John L. Bryan, professor emeritus of Fire Protection Engineering at the University of Maryland and a leading international authority on fire safety. To develop content for a fire safety learning experience Bryan's work on fatal campus fires, including occupant behaviors during a fire, facility fire safety protections systems, and college fire causes, is a primary source. Campus Firewatch's (2011) list of fatal campus fires indicates that 81% of fatal fires occur in off-campus housing. This is not often a common discussion item either in on-

campus housing orientation or fire safety meetings, but might be included in future efforts.

Adams's (1983) *Firesafety Educator's Handbook* presented one of the first comprehensive guides for full-time fire safety educators. Adams major premise was that fire safety education was starting to become an operational part of the fire service and not just a voluntary activity done by firefighters in the time they were not fighting fires. Educating those in this new role by relating a six-step process with insights provided by practicing fire safety educators was the aim of this handbook. The six steps described included message, methods, market, money, materials, and media. Although nothing in this handbook specifically addressed the education of college students, it did distinguish the learning differences between children, adolescents, adults, and elderly adults. It suggested first person case studies, self-assessment instruments, experience-based discussions, care giving activities, and games, simulations and role-playing were effective teaching techniques for adolescents.

In the discussion of the techniques, Adams (1983) did not correlate them to specific learning theories nor offer conjecture as to why they might be effective. For adults, Smalley (1983) suggested that one should adjust teaching methods based on the adult's "areas of involvement" (p. 88) but no specifics were offered. The materials section reviews education techniques including lecture, posters, brochures, flyers, films, and slide tapes. Adams (1983) described lectures as an "effective means of reaching a small to mid-size group of people (no more than 3 dozen)" (p.150), which should include discussion and demonstration. "Because the lecture/demonstration is passive, the

observer needs to be made active to maximize learning" adding, "whenever possible, demonstrate a technique and try to get the audience to practice with you" (p. 150).

Adams (1983) described films as having "the ability to pull us totally into what we are viewing, heart as well as mind," further stating they "can draw out of us a 'feeling response' to a particular problem, which in turn can impel us to action" (p. 154). He suggested that in order to improve the effectiveness of a film, it needs to be introduced like a guest speaker with the main points summarized when it is complete, and should be only a part of a program that included other materials. The slide tape is described by Adams as another effective tool using audio-visual materials to enhance learning. The slide tape is a device that projects changing still images linked to a audio tape that either narrates the images or plays background music. Duplicating this tool with newer technology could be accomplished by projecting an automated PowerPoint. Adams called a projection of still images set to music a potential "emotional blockbuster" and possibly an excellent way to summarize and conclude a fire safety presentation.

The U.S. Fire Administration Report (2008), *Public Fire Education Planning: A Five Step Process*, discussed the general program planning aspects for developing a fire safety intervention program by a Fire Prevention Officer, a formal role within a fire department. As the title suggests, it promoted a five-step process that included conducting a community risk assessment, developing community partners, creating an intervention strategy (which includes education, engineering controls, and enforcement), implementing the program, and evaluating its effectiveness. Relevant to fire safety education for residential students, the third step of creating an intervention strategy offers

some general information about creating an education program. It suggested that one should conduct market research to understand one's audience.

> Successful risk reduction efforts are more likely to be effective when the members of the target population: are aware of the problem; understand the problem and the factors that contribute to it; believe themselves, or their loved ones, to be personally at risk; believe that the risk is unacceptable and serious; understand that solutions to the problem exist; believe that changing their behavior will reduce the risk; believe that the benefits of the change outweigh the barriers; believe that they are capable of making the expected behavioral change; are involved with the process from the beginning; and have an opportunity to provide input and suggestions. (pp. 3-5 – 3-6)

This is a long and wandering list, but it did include the three elements related to the Theory of Planned Behavior (TPB), a framework of this study, which included behavioral beliefs, normative beliefs, and control beliefs. The book identified three types of interventions that should be combined for effective programming: these include education, defined as "providing information (facts) about risk and prevention," engineering, defined as "using technology to create safer products or modifying the environment where risk is occurring," and enforcement, "rules that require the use of a safety initiative" (pp. 3-7). The report did not go into further depth about education, but offered examples of what it is by using verbs such as teach, educate, and reinforce when it described education activities.

Longcore and Rossiter's (2008) overview of the New York State Fire Safety Act also provided a Fire Safety Template for Floor Meetings used at Syracuse University. It provided insight into the fire safety education contents at a large university including: information about inspections, fire drills, university fire prevention related policies (no

candles, no smoking, etc.), and safe behaviors during a fire or alarm. Several fact sheets developed by the American Society of Safety Engineers (ASSE), Fire Protection Practice Specialty in 2009 titled, *How to Prevent On/Off-Campus Fires, ASSE Fact Sheet 2, Fire Escape Planning: What to Do in Case of a Fire, ASSE Fact Sheet3,* and *Fire Safety Equipment for Off-Campus and Greek Housing, ASSE Fact Sheet 4* offered similar information.

Content for university fire safety efforts, while not shown to be effective or ineffective at preventing a fatality, does seem to have become more consistent over time. It included information about what to do to prevent fires and what to do should a fire occur. To help determine the most important topics of concern that campus fire safety professionals have and to help focus the content of the learning experience, 17 of the leading campus professionals were sent an email on October 5, 2009. The email explained my role professionally and as a graduate student studying the effective training methods aimed at changing student fire safety behaviors. I asked for a reply to the question, “”what do you think are the three most important behaviors to change?” The results of this informal survey indicated that knowing evacuation routes, knowing fire safe behaviors related to cooking, and understanding the hazards of tampering with or ignoring fire protection equipment were the most important behaviors to influence. These three topics will be the focus of the fire safety learning experience intervention that will be used to measure the effectiveness of various formats.

Millennial Students

Millennial Generation Characteristics and Learning Styles

Today's traditional age college students are part of a generation, referred to commonly as the Millennial Generation by Howe and Strauss (2000). They are sometimes referred to as the Net Generation by other authors (Junco & Cole-Avent, 2008). Howe and Strauss (2000) defined a generation as "a society-wide peer group, born over a period roughly the same length as the passage from youth to adulthood (in today's America, around twenty or twenty-one years), who collectively possess a common persona" (p. 40). Coomes and DeBard (2004) added that a generation's common history and popular culture help shape their values, attitudes, and beliefs. Taken together these comprise a framework that calls today's traditional age college students, Millennial students. Prensky (2001) referred to the current generation of students as digital natives, referring to the fact that they have grown up with a digital "language" and culture that an older digital immigrant cannot speak without an accent. Generational differences such as those described by Howe and Strauss (2000), Coomes and DeBard (2004), and Prensky (2001) likely will influence the ways these students understand and learn about fire safety.

Howe and Strauss (2007) and DeBard (2004) have described Millennial generation students as having seven defining characteristics; special, sheltered, confident, team-oriented, conventional, pressured, and achieving. Each of these affects their learning experience in college and the way they perceive change. The first characteristic described is that this generation of students feels that they are special. They have been

treated as special when they were younger and feel that, as a group, they will be the builders of something better. Using constructivist methods that allow students to build part of the learning experience themselves, might be important to helping students create new meanings.

DeBard (2004) also used the terms sheltered and confident to describe Millennial students. Millennials are confident because they believe they can meet expectations, and they also have desire to meet the expectations of authority figures. Authority figures play an important role for this sheltered generation as they are described as reliant on them. In a learning experience for these students, an authority figure might be successful in setting boundaries and expectations that the students will respect.

Team-oriented is another characteristic DeBard (2004) used to describe Millennial students, so cooperative learning experiences should prove satisfying and have a positive impact on learning. DeBard also used the terms achieving, conventional, and pressured to describe Millennial students, characteristics that relate to this generation's desire to perform at a high level and willingness to follow rules to achieve this. During a learning experience, each of these characteristics can be recognized and reinforced by adding structure and strong conclusions in order for the learners to feel that have succeeded and not feel pressured by the results.

Prensky (2001) took the reported desire of Millennials, as digital natives, to use technology beyond a preference and went so far as to suggest, "today's students think and process information fundamentally differently from their predecessors" (p. 1). The metaphor of immigrant versus native is used to describe how totally and completely

today's students are part of, speak with, and make meaning through digital technology and its unique ways of presenting information. For example, the random nature of the way one can click on a hyperlink and head in a new direction at an instant is unique to the technology and expected by Millennial students. The visual graphical nature of digital media where words are only used as subtext for details is unique and different from pre-digital ways of sharing information. Prensky argued that previous generations, who did not grow up with digital technology as completely, must recognize that their meanings are fundamentally different. He used the metaphor that these previous generations are like digital immigrants and thus speak with an accent they can never lose. As an example, digital natives instantly turn to digital technology first, while immigrants might choose a paper source first. The patterns of learning are starkly different:

> Digital Natives are used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics before their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to "serious" work. (Prensky, 2001, p. 2)

Use of digital tools to convey information in such a way that learners interact with the information source, decide how it is delivered, and in what order, and using visual methods of presenting information is believed to be preferable for helping Millennial generation students learn (Prensky, 2001). Imitating games and including a simulation of actual situations might also fit with the learning style of digital natives. However, developing digital technology such as a game simulation is often an expensive and time-consuming proposition so it will not be possible in every scenario. Nonetheless,

understanding possible processing differences or at least preferences for receiving information can help influence the structure of the learning experience for current traditional age college students.

On the other hand, Bennett, Maton, and Kervin (2008) suggest that we are paying too much attention to the digital native concept without empirical evidence that it exists. The authors argued that Prensky (2001) reached many of his conclusions based on personal experience and not empirical research, so caution is appropriate. They argued that the design of a learning experience should not shun traditional adult learning practices. Instead, it should incorporate some of the concepts believed to be most important in educating Millennial students, hoping to improve chances for success without stepping outside of techniques with a strong record of success.

Educational methods should include lecture, cooperative exercises, and active or experiential components in order to address a variety of learning styles and those specific to Millennial, digital residents. Wilson (2004) supported using a variety of styles to address the diversity of the Millennial student population and to help "students develop a variety of strategies for learning and assist them in determining which ones are likely to be most effective in a particular situation" (p. 64). Wilson also noted that these same students will have an expectation that technology will be part of the learning experience. This might include tutorials on additional topics such as fire extinguisher use, digital alarm technology, and information to share with parents who are a big part of this generation's daily lives.

Cooperative and experiential learning exercises are something Millennials have experienced since kindergarten and they are comfortable in this environment. Such exercises may be particularly appropriate for the new social setting of the residence hall as they help the students develop a shared meaning about fire safety and expected normative beliefs. Delivering highly effective learning experiences sensitive to the needs and culture of current college students is an imperative for the desired life-long impact. Making sure students are safe in their residence is one aspect of that effort. For that to happen, students must adopt behaviors that will help them to protect themselves. As Barrows and Thurman (1988) pointed out, students' perceptions are different than their actual knowledge on this topic so effective education can play a role in filling the gap.

Millennial Students Peer and Non-Peer Learning

Peer educators can be defined by a variety of terms including student coach, peer counselor, student assistant, resident assistant, and orientation leader (Newton & Ender, 2010). In general "peer educators are students who have been selected, trained, and designated by a campus authority to offer educational services to their peers" (p. 6). They are also an inexpensive source of effective labor that might also benefit from the opportunity of serving in the leader role. Their effectiveness is related to their being part of the peer group that influences the learner's expectations, attitudes and behaviors. Newton and Ender encourage peer educators to lead active learning processes, be self aware about their limitations and be willing to grow in order to be effective. They must also be able to lean on their trainers and be part of a supportive learning community.

Peer educators have been shown to be effective in recent student health behavior intervention strategies (Brack, Millard, & Shah, 2008; Stein, 2007). This delivery method might lead to the same positive discussions about fire safety among the learners as has been shown to occur in the other health behavior interventions, and therefore stimulate the learning process. If evaluations of this method indicate it is a viable alternative to the traditional fire safety professional delivery method, it could prove beneficial for smaller universities without full-time environmental health and safety (EHS) staff.

In contrast, DeBard (2004) described Millennial students as confident they can meet expectations, and they have a desire to meet the expectations of authority figures. Authority figures are important role models for this sheltered generation and they rely on and trust the information they are given by them. In a learning experience for these students, an authority figure might be successful in setting boundaries and suggesting behaviors that the students will respect and follow. The Pew Research Center (Taylor & Keeter, 2010) suggested that Millennials respect their elders and say that the older generation is superior to their generation in terms of moral values and work ethic.

Millennial Students and Experiential Learning

Junco (2007) stated that Millennial generation learners have a combination of four qualities that are opposite of the previous generation and they surprise many educators. Millennials are “driven, social, experiential learners, and multitaskers” (p. 138). Kolb (1984) defined learning and then experiential learning as:

> Learning is a process whereby knowledge is created through the transformation of experience. This definition emphasizes several critical aspects of the learning process as viewed from the experiential perspective. First is the emphasis on the

> process of adaption and learning as opposed to content or outcomes. Second is that knowledge is a transformation process being continuously created and recreated, not an independent entity to be acquired or transmitted. Third, learning transforms experience in both its objective and subjective forms. Finally, to understand learning, we must understand the nature of knowledge, and vice versa. (p. 38)

Kolb further asserted that the theory of experiential learning included four modes of learning that help bring together behavioral and cognitive learning theories into one comprehensive theory. The model included a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Concrete experience and abstract conceptualization (prehension) are a diametrically opposed pair, as are reflective observation and active experimentation (transformative). Chickering (1977) offered this expansion on Kolb's theory:

> Effective learning therefore has four ingredients that themselves call for four different abilities. The learners must be able to enter new experiences openly and fully without bias; they must be able to stand back from those experiences, observe them with some detachment, and reflect on their significance; they must be able to develop a logic, a theory, a conceptual framework that gives some order to the observations; and they must be able to use those concepts to make decisions, to solve problems, to take action. (p. 18)

Junco (2007) argues that Millennial generation students preferred social interaction in their learning experience and that including learning partners, study groups, and other social connections within the learning environment can be beneficial to student learning. The definition Junco uses for experiential learning suggests, "knowledge that is organized by the learner and obtained through direct participation or experience" (p. 141). Junco continues to suggest that the time for experiential learning be created by reduced lecture

time in a learning experience and that students be allowed to draw their own conclusions and create their own knowledge. Chickering and Reisser (1993) concluded that education is more complete when it seeks to include interpersonal competence and relationship building, rather than promoting students learning in isolation without a need or opportunity to work with each other.

Oblinger and Oblinger (2005) concurred in the Introduction to their edited work *Educating the Net Generation* state, "virtually all those who study the Net Generation believe that their preference for experiential, hands-on learning is a distinguishing characteristic" (p. 1.3). Oblinger (2003) previously stated that experiential learning as a learning preference of Millennials:

> Along with differences in attitudes, Millennials exhibit distinct learning styles. For example, their learning preferences tend toward teamwork, experiential activities, structure, and the use of technology. Their strengths include multitasking, goal orientation, positive attitudes, and a collaborative style. (p. 2)

Chickering and Reisser (1993) indicate critical consequences of experiential learning include:

> First, experiential learning attaches major importance to ideas. When ideas are used as hypotheses and tested in action, their significance and the attention given to them is greater than when they are simply memorized or left as unexamined abstractions. An idea taken as affixed truth gives no cause for further thought. An idea as a working hypothesis must undergo continual scrutiny and modification. That, in turn, creates pressures for accurate and precise formulation of the idea itself. Second, when an idea is tested for its consequences, results must be acutely observed and analyzed. Activity not checked by observation and analysis may be enjoyable, but intellectually it usually leads nowhere, neither to greater clarification nor to new ideas and experiences. Third, reflective review requires both discrimination and synthesis to create a record of the significant elements of

> the experience. It involves looking back on experiences to find meaning that provide new contexts for future learning. (p. 380)

To include experiential learning for Millennials, Skiba and Barton (2006) suggest the use of simulations to engage the learners in an interactive process that allows for feedback and practices real life scenarios. While there are a variety of ways to include an experiential learning component in a formal learning experience, much of the literature suggests any effort will be beneficial to student learning and possible behavior change.

Application of Theory of Planned Behavior

The Theory of Planned Behavior (TPB), first described by Ajzen (1985, 1988, 1991), and later expanded by Ajzen and Fishbein (2005), postulates that two factors offer primary predictors of future behavior. These factors are the intention to perform the behavior and perceived control or ability to perform the behavior. Ajzen has expanded this theory over time and in a 2006 writing used three predictors:

> Human behavior is guided by three kinds of consideration: beliefs about likely outcomes of the behavior and the evaluations of these outcomes (behavioral beliefs), beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs), and beliefs about the presence of the factors that facilitate or impede performance of the behavior and the perceived power of these factors (control beliefs). (p. 1)

Armitage and Conner (2001), in a meta-analysis of 185 independent, published studies of TPB support the theory while suggesting ways to improve future research. The studies generally supported the basis of TPB, that there is a relationship between attitude and behavior. One weakness of some TPB studies was that they relied on self-reported data. This analysis included both types of studies, 44 with self-reported behaviors and 19 with

observed behaviors. The comparison between the two types indicated that TPB can account for a large portion of the variance in actual behavior. Although not conclusive, it provided further evidence of the model as a predictor of behavior. Of the 185 studies analyzed, at least 88 of these studies related to health behavior intervention programs, some specific to college student populations; none were specific to fire safety.

No fire safety survey instrument could be located, so Ajzen's (2006) *Constructing a TpB Questionnaire: Conceptual and Methodological Considerations* and Francis et al. (2004) *Constructing Questionnaires Based on the Theory of Planned Behavior: A Manual for Health Service Researchers* were used as primary sources for development information. They suggested that a survey instrument should attempt to measure behavioral intention by looking at the four dimensions proposed by Ajzen (2006), generalized intention to perform the behavior, the subject's attitudes about the behavior, their feelings about how normal the behavior is (subjective norm), and their perceived control over performing the behavior. Francis et al. (2004) further suggested that an instrument should measure behavioral intention in the four dimensions using a Likert scale, with the scale covering a range from strongly disagree to strongly agree.

CHAPTER III

METHODOLOGY

Introduction

This study used a quasi-experimental post-test design to measure the effectiveness of various methods of fire safety education for residential college students. The study investigated whether peer educators, versus authority figures, have a significant effect on a formal fire safety learning experiences as measured by predicted behavior change. It also sought to measure if the inclusion of an experiential learning component in the learning experience increases its effectiveness when compared to traditional lecture learning experiences.

Residential students from three high-rise residence halls received fire safety education as part of their first floor meeting of the school year. Each floor was randomly assigned a fire safety learning experience type that will have a peer or non-peer facilitator presenting information from a standard course outline with an additional element possibly added to the presentation (additional variable) of an experiential learning component. Following the learning experience, the Residential Student Fire Safety Behavior Survey (RSFSBS) (see Appendix B) was completed by the participants and the results analyzed to see which combination of delivery techniques (peer educator and experiential learning techniques) were most effective at changing behavior intentions. The behavior change was determined by measuring students' difference in behavioral

beliefs, normative beliefs, and control beliefs as outlined in Ajzen's (1991) Theory of Planned Behavior (TPB).

Participants

Participants included residential students from three residence halls divided into treatment groups based on floor and building. A total of twenty floors, each with a possible population of 50 students, were used to create treatment groups. This allowed the regular pattern of meetings for new residents to occur as it normally would have. They were undergraduate students attending a large public research university in the southeastern United States. Each of the residence halls were either eight or nine stories tall, two housing almost exclusively freshman, and all three being coeducational.

Instrument

Residential Student Fire Safety Behavior Survey

Informing fire safety educators about how to make their efforts effective at changing behaviors and possibly a little more important in the minds of the student participants requires a measurement instrument. The RSFSBS is an original survey instrument intended to measure behavior intentions of residential students using Ajzen's (1991) TPB. Appendix A includes a copy of the previously piloted instrument. The survey was administered following the training intervention and determined the students' behavioral intent related to exiting buildings during a fire emergency. Appendix B is a copy of the survey modified as a result of the pilot study and changes in demographic questions suggested by my committee members. The design of the instrument used concepts proposed by Ajzen (2006) in *Constructing a TpB Questionnaire: Conceptual*

and Methodological Considerations and Francis et al. (2004) in *Constructing Questionnaires Based on the Theory of Planned Behavior: A Manual for Health Service Researchers*. The survey attempted to measure behavioral intention by looking at four dimensions proposed by Ajzen (2006), generalized intention to perform the behavior, the students' attitudes about the behavior, their feelings about how normal the behavior is (subjective norm), and their perceived control over performing the behavior. The instrument measured behavioral intention in the four dimensions using a four point Likert scale, with the scale covering strongly disagree to strongly agree.

Following the learning experience, the RSFSB survey instrument was completed by the participants and then analyzed to see which combination of delivery techniques (peer educator, and experiential learning techniques) were most effective at changing behavior intentions. The behavior change was determined by comparing the total mean scores students change in behavioral beliefs, normative beliefs, and control beliefs. As outlined in Ajzen's Theory of Planned Behavior, these three dimensions help determine a fourth dimension, the intention to perform the behavior (also directly measured), which is a strong predictor of behavior. In the pilot study thirty responses were collected and analyzed. Items with poor internal reliability, and poor construct reliability were changed or eliminated for the final instrument.

Pilot Study Participants

Participants for the research study included residential students from three residence halls divided into treatment groups based on floor and building. They were undergraduate students attending a large public research university in the southeastern

United States. Each of the three residence halls are either eight or nine stories tall, two housing exclusively freshman, and all three being coeducational. Participants in the pilot study included 30 students from a similar university population attending the same university, but they were not all housed in these three residence halls. The pilot study occurred in the spring, so it is likely these students had been exposed to education and experiences different from a new residential student, but it believed they reacted similarly to the phrasing and content of the survey instrument.

Reliability

The RSFSBS instrument's four dimensions were each analyzed independently to determine the reliability within the dimension. Questions two through seven measured the generalized intention dimension, questions eight through fifteen measured the attitude dimension, questions sixteen through twenty-one the subjective norm dimension and twenty-two through twenty-eight the perceived behavioral control dimension.

The first dimension, the measurement of generalized intention, showed a strong Cronbach's Alpha (.889) and computations to determine if deleting one item could increase Alpha indicate it could be raised slightly if the first item was removed, but would decrease if any other item were removed. The lowest corrected point-biserial is .532 is also for the item that if removed could increased the reliability within the dimension. This indicates that all of the items work relatively well together (see Tables 1 and 2).

Table 1

RSFSBS Pilot Study Generalized Intention Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.889	.892	6

Table 2

RSFSBS Pilot Study Generalized Intention Item—Total Statistics

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
2. Want to Know Two Ways Out	17.50	7.638	.532	.392	.894
3. Intend to Exit Upon Alarm	17.53	6.464	.787	.638	.856
4. I Expect to Learn Two Ways Out	17.63	6.309	.693	.608	.873
5. I Intend to Know Two Ways Out	17.50	6.603	.838	.749	.851
6. I Want to Evacuate	17.57	6.392	.662	.536	.879
7. I Expect to Evacuate	17.60	6.524	.764	.704	.860

The second dimension, the measurement of attitude toward the fire safety behavior, showed a Cronbach's Alpha of .761 and computations to determine if deleting one item would increase Alpha indicated it could be raised if the last item, "evacuating when the fire alarm sounds is unpleasant (for me)" was removed, this is only a slight

change. This indicates that this dimension could be improved to an Alpha of .815 by removing this item and replacing it with a new item. The word “unpleasant” is believed to have been the problem with this item and it was replaced with the term “objectionable” to measure attitude on the survey used following the interventions (see Tables 3 and 4).

Table 3

RSFSBS Pilot Study Attitude toward Behavior Reliability Statistics

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	Number of Items
.761	.838	8

Table 4

RSFSBS Pilot Study Attitude toward Behavior Item-Total Statistics

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
8. Knowing Two Ways Out is Beneficial	23.93	7.847	.673	.842	.712
9. Knowing Two Ways Out is Important	23.86	8.275	.559	.706	.730
10. Evacuating is Convenient	24.61	7.284	.364	.288	.767
11. Evacuating is Critical	24.11	6.988	.712	.559	.689
12. Knowing Two Ways Out is Useful	23.89	7.655	.797	.925	.698
13. Knowing Two Ways Out is Advantageous	23.86	7.979	.695	.878	.714

Table 4 (cont)

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
14. Evacuating is Important	24.11	7.729	.365	.238	.757
15. Evacuating is Unpleasant	25.14	8.275	.146	.350	.815

The third dimension, the measurement of subjective norms, showed a Cronbach's Alpha of .548 and computations to determine if deleting one item could increase Alpha indicated it could be raised slightly if the first and last questions were removed or changed (see Tables 5 and 6). The wording for the items in this dimension was modified in the final survey instrument in hopes of improving the reliability of the items. The words "most people who are important think" were changed to "people important to me think" based on feedback from colleagues assisting with the pilot study. The corrected point-biserial for survey item one is .130. With both of these items removed, the Cronbach Alpha is re-computed to be .585, which approaches the .600 minimum (see Tables 7 and 8). These items seem to get a variety of responses possibly indicating that the subjective norms of the students related to fire safety vary greatly. With only six items, reliability might be increased with the addition of more items, but then the survey would approach becoming too long. It was assumed that the greater number of respondents to the final survey will improve the reliability.

During the development and initial testing of the RSFSB instrument, this dimension proved difficult, as the items responses did not correlate as well with the other items. It appears subjective norms related to fire safety vary greatly.

Table 5

RSFSBS Pilot Study Subjective Norms Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.548	.576	6

Table 6

RSFSBS Pilot Study Subjective Norms Item-Total Statistics

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
16. Most People Think I Should Know Two Ways Out	14.59	5.984	.130	.174	.582
17. Everyone Expects to Know Two Ways Out	23.86	8.275	.559	.706	.730
18. Social Pressure to Know Two Ways Out	24.61	7.284	.364	.288	.767
19. Expected to Exit When Alarm Sounds	24.11	6.988	.712	.559	.689
20. Social Pressure to Exit	23.89	7.655	.797	.925	.698
21. Most People Think I Should Evacuate	23.86	7.979	.695	.878	.714

Table 7

RSFSBS Pilot Study Subjective Norms Reliability Statistics with Items 1 and 6 Removed

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.585	.589	4

Table 8

RSFSBS Pilot Study Subjective Norms Item-Total Statistics with Items 16 and 21 Removed

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
17. Everyone Expects to Know Two Ways Out	7.93	3.352	.274	.293	.580
18. Social Pressure to Know Two Ways Out	9.21	2.241	.677	..529	.224
19. Expected to Exit When Alarm Sounds	7.62	3.958	.231	.169	.602
20. Social Pressure to Exit	8.86	2.409	..361	.468	.548

The fourth dimension, the perceived behavioral control dimension, showed a Cronbach's Alpha of .825 (see Table 9). Computations to determine if deleting one item could increase Alpha indicated that it could be raised significantly if the last item, "it is entirely up to me if I learn two ways out from the building where I sleep" was removed, but would decrease if any other item were removed. This indicates that this dimension

could be improved to an Alpha of .836 by removing this item and replacing it with a new item. However, with an Alpha above .800 already this was not considered necessary and the items for the dimension were not altered (see Table 10).

Table 9

RSFSBS Pilot Study Perceived Behavioral Control Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
.825	.852	8

Table 10

RSFSBS Pilot Perceived Behavioral Control Item-Total Statistics

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
22. Confident I Can Learn Two Ways Out	23.54	12.999	.641	.758	.801
23. Easy to Know Two Ways Out	23.71	11.841	.577	.735	.801
22. Confident I can Evacuate	23.54	12.925	.663	.893	.799
24. It is Easy for Me to Evacuate	23.61	13.284	.406	.649	.822
25. I Control Knowing Two Exits	23.57	11.735	.788	.749	.777
26. It is Entirely Up to Me to Know Two Ways Out	23.93	12.661	.354	.459	.836

Table 10 (cont)

Question	Scale Mean, if Item Deleted	Scale Variance, if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha, if Item Deleted
27. I Control Evacuating	23.75	11.306	.699	.790	.783
28. It is Entirely Up to Me to Evacuate	24.11	11.062	.514	.580	.819

Validity

A factor analysis was attempted in order to determine if the items on the RSFSBS instrument would divide into the four dimensions originally developed. This attempt failed and the SPSS software could not compute factors from the sample size of 30. The items all measured various behaviors of one construct, exiting during a fire and it is possible they more strongly measure that than the four dimensions concerning the behavior intent. A principle components analysis was also attempted, but did not assist in helping show validity. An attempt at forcing two dimensions into two factors did not yield much information either. However, this did raise curiosity about items 18 and 20 which stood out, and upon a closer look their average response scores were lower than the other items in the dimension. It was hypothesized that because these two items use the term “social pressure” for consideration of normative beliefs, whereas the other items use terms such as “most people that are important to me” and “it is expected that I,” the students completing the survey hold considerably different meaning for these terms as they relate to fire safety. These are the terms suggested by Francis et al. (2004) for a valid TPB instrument, but this might be a special case related to how young college students

look at the persons they consider important to them (parents, family, etc.) and their social peers. Revision of this wording might improve validity but this was not attempted as the sample size did not offer great enough insight to override the advice of the published guidance on developing this type of survey instrument (see Table 11).

Table 11

RSFSBS Pilot Subjective Norm Dimension Item Statistics

Question	*M*	*SD*	*N* of Items
16. Most People Think I Should Know Two Ways Out	3.07	.884	29
17. Everyone Expects to Know Two Ways Out	3.28	.751	29
18. Social Pressure to Know Two Ways Out	2.00	.845	29
19. Expected to Exit When Alarm Sounds	3.59	.501	29
20. Social Pressure to Exit	2.34	1.045	29
21. Most People Think I Should Evacuate	3.38	.728	29

Face validity was assured by the use of terms taken directly from the research concerning developing survey instruments for TPB and health related behaviors by Francis et al. (2004). The language of the questions might have been improved to increase this form of validity, but the sample size of 30 was also a limiting factor in developing validity measures. The content of the items was developed from a group of campus fire safety experts from around the country.

The results of the pilot study indicated that the subjective norm dimension might be improved with wording changes. This might also include increasing the number of items in this dimension to include two more items that favor family as a locus for subjective norms and several that favor peers as that locus. The average scores on the four point scale were all very high, with none averaging one. This suggests that almost everyone has a relatively positive perspective of fire safety. To improve discrimination, the scale might have been changed to reflect a score of one as disagree, two as somewhat agree, three as agree, and four as strongly agree. This could have allowed for more variance among scores for items, but was not attempted as guidance from the published literature was given precedence over the results of the small pilot study.

Procedures

At the beginning of the fall semester, students in each of the three high rise residence halls being used for this research were assigned a move in day. Near the end of that day, they attended an hour long mandatory floor meeting led by their Resident Assistant (RA). The various policies and procedures for living in their new home were explained. Fifty students typically live on a floor in these building, so the meetings occurred in the main hallway of the floor. These particular residence halls have double loaded corridors with common bathrooms, typical of residence halls built in the 1960's and 1970's. During each meeting fire safety was discussed as part of the agenda and assigned between five and ten minutes. For this research, each floor was considered a treatment group. Each building/floor treatment group was randomly assigned to one of the four learning experiences using a combination of the two variables (peer educator and

experiential learning techniques). Initially, 22 floors were going to be used for treatment groups, but two floors had their students move-in early as part of a special learning community, so they were not included in the study as they would not be given the same orientation and first floor meeting experience. During the floor meeting, either an RA (peer educator) or a uniformed firefighter (authority figure) delivered the fire safety information using a script that included fire safety information provided to all residential students at the university and information deemed important by university fire safety experts polled previously. One outline (appendix C) was followed for the lecture only intervention and the other (appendix D) contained additional information concerning experiential education elements to be included in the training. The RA's and firefighters were trained on their particular type of intervention a week prior and requested to practice their presentations and follow the outlines closely and use the techniques requested for their particular floor. The importance of this in context to the research project and its goals were also discussed.

The RA's were also trained to administer the survey, including the consent form and explaining its contents and meaning. Immediately following the learning experiences and before the meeting resumed, the students were asked to complete a paper RSFSB survey instrument to measure their intentions, behavioral beliefs, normative beliefs, and control beliefs related to fire safety behaviors. The RSFSB survey instrument included 34 questions concerning fire safety beliefs, demographic information (sex, age, race, year in school, and room number).

Analysis

A preliminary statistical analysis was performed on the instrument's results to provide descriptive statistics, including frequencies of various types of demographic information. A factorial analysis of variance was used to determine if there was a significant difference in the effectiveness (measured by a high numerical score on the RSFSBS) of the different fire safety learning experience variables. For the purpose of this study the significance level was set at $p < .05$. In addition, a confirmatory factor analysis of the RSFSBS was used to verify how the factors hold together based on the Theory of Planned Behavior (TPB). An estimate of reliability using Cronbach's Alpha was used to check the internal consistency and if the constructs group together as expected.

Limitations

The primary limitation of this study was related to the variability in delivery, as the same person will not be delivering the information to each group. Having non-peer educators and peer educators participate in a training session to practice intended delivery techniques and better understand the learning theories behind them assisted in reducing this variability. Additionally, there may have been some bias as the individuals receiving a particular treatment will all be on the same floor and building, which may have involved some selection bias (intentional or unintentional) when floor and building assignment were made by Housing and Residence Life staff. This was be minimized by the random selection process used to determine which building and floor received which learning experience variables.

CHAPTER IV

RESULTS

Introduction

The data for this study were analyzed on several levels. First, the descriptive statistics for residential student participants provide basic demographic information. Next a confirmatory factor analysis of the Residential Student Fire Safety Behavior Survey (RSFSBS) to verify how the factors hold together based on the Theory of Planned Behavior (TPB). An estimate of reliability using Cronbach's Alpha was used to check the internal reliability of the four dimensions. A comparison of total mean scores was conducted to compare peer vs. authority figure and lecture vs. experiential learning to determine if one method showed significantly better results. Finally, a factorial analysis of variance was used to determine if there was a significant difference between the four combinations of intervention types.

Descriptive Statistics

A total of 689 surveys were collected from residential students following initial fire safety training on the day they moved into their residence hall. The training interventions and completion of surveys occurred on August 17, 18, and 19, 2011, in three high rise residence halls at a large public research university in the southeastern United States. Each of the residence halls were either eight or nine stories tall, two housing almost exclusively freshman, and all three being coeducational. The students all

were required to attend the first floor meeting, but because not all students had moved in at that point, not everyone could have been at the meetings. It is estimated that up to 1,000 students could have attended the meetings. With 689 surveys collected, the estimated response rate was approximately 68.9 %. Thirty-nine survey responses were not used because, despite signing a consent form indicating they were 18 years old, the respondents indicated they were 17 years old on their survey, so only 650 surveys were used for the data analysis.

Of the 650 residential students surveyed, 214 (33%) were male and 435 (67%) were female. This is not unusual for this institution, as its 2010-11 Fact Book reported that the undergraduate student body was 34% male and 66% female. A majority of the students reported they were 18 years old, 491 (76%), whereas 98 (15%) reported being 19 years old, 40 (6%) being 20, with the remaining 21 (4%) reporting as either 21, 22, 23, or 25 years old. Similar numbers reported being in their first year of college 493 (76%), with 89 (14%) being in their second year, 55 (8%) being in their third year, and 12 (2%) in their fourth year. No respondent reported being in their fifth or greater year, though one person did not provide a response to this question.

Race and ethnicity were reported using identifiers consistent with those used by the university where the research was conducted. Thirty one respondents (5%) reported themselves as Hispanic or Latino, 6 (less than 1%) students identified themselves as belonging to more than one race, 6 (less than 1%) respondents identified themselves as American Indian or Native Alaskan, 2 (less than 1%) respondents identified themselves as Native Hawaiian or Other Pacific Islander, 28 (4%) respondents identified themselves

as Asian, 205 (33%) respondents identified themselves as Black or African American, and 384 (61%) respondents identified themselves as White. These numbers are very similar to those for the institution as a whole. The only percentages that were not the same or at least within two percentage points were for Black or African American students which comprise only 23% of the students of the whole institution and White students which comprise 64% of the institution. See Table 12 for demographic information.

Table 12

Frequencies and Percentiles of Sample Population Demographics

Variable	*n*	%
Gender		
Male	214	33
Female	435	67
Age		
18	491	76
19	98	15
20	40	6
21 to 25	21	3
College Year		
1	493	76
2	89	14
3	55	8
4	12	2
5 or more	0	0
Race/Ethnicity		
Hispanic/Latino	31	4
American Indian/Native Alaskan	6	< 1
Native Hawaiian/Other Pacific Islander	6	< 1
Asian	28	4
Black/African American	205	32
White	384	59
Total	650	100

Four different interventions were given to the 650 survey respondents; including a peer educator using strictly lecture educational techniques (L). The peer was the Resident Assistant (RA) assigned to their floor, and this was abbreviated as an RAL intervention. When an RA also added experiential learning techniques (E) to the intervention it was called an RAE intervention. The same naming convention was used for interventions that were conducted by authority figures, in this case uniformed firefighters from the municipal fire department (MFD) resulting in a MFDL and MFDE intervention types. Of the 650 respondents, 183 (28%) received a RAL intervention, 163 (25%) a RAE intervention, 164 (25%) a MFDL intervention and 140 (22%) a MFDE intervention. The difference in sample population sizes was due to random assignment of interventions and the various levels of attendance on the various floors on the residence hall. See Table 13 for breakdown by intervention.

Table 13

Frequencies and Percentiles of Intervention Types

Variable	*n*	%
Intervention Type		
Peer Educator	345	53
Authority Figure	303	47
Lecture Only	344	53
Experiential Learning	304	47
Combined Interventions		
RAL	183	28
RAE	163	25
MFDL	164	25
MFDE	140	22
Total	650	100

Confirmatory Factor Analysis

Next a confirmatory factor analysis of the Residential Student Fire Safety Behavior Survey (RSFSBS) was performed to verify how the factors hold together based on the Theory of Planned Behavior (TPB). Sixty-seven percent of the variance in the RSFSBS was explained by four factors, with the first explaining almost 50% of the variance (see Table 14). The survey questions were designed to look at the four separate dimensions of TPB, with questions two through seven measuring the generalized intention dimension, questions eight through fifteen measured the attitude dimension, questions 16 through 21 the subjective norm dimension, and questions 22 through 28 the perceived behavioral control dimension. The first factor indicated that the intention, attitude, and perceived control dimensions are more correlated, whereas the third dimension, subjective norm did not fit with the other three factors as well. The second component grouped two items from the subjective norm dimension, but not all. A possible explanation is the subjective norm questions did not measure the same thing or the participants did not see them as related (see Table 15). Question 15 was the one question that was reverse coded and it appears that some participants answered this question with a four, like they did every other question, not noticing the reversed wording. This may have caused this question to not correlate well with any other questions.

Table 14

Total Variance Explained: Principal Component Analysis

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	**Total**	**Percent of Variance**	**Cumulative Percent**	**Total**	**Percent of Variance**	**Cumulative Percent**
1	13.751	49.111	49.111	13.751	49.111	49.111
2	2.293	8.188	57.299	2.293	8.188	57.299
3	1.627	5.810	63.108	1.627	5.810	63.108
4	1.124	4.015	67.124	1.124	4.015	67.124
5	.800	2.857	69.981	--	--	--
6	.773	2.762	72.743	--	--	--
7	.700	2.502	75.245	--	--	--
8	.659	2.352	77.597	--	--	--

Table 15

Component Matrix: Principal Component Analysis

	Component			
Question	**1**	**2**	**3**	**4**
2. Want to Know Two Ways Out	**.751**	-.167	-.056	.139
3. Intend to Exit Upon Alarm	**.721**	-.203	-.080	.238
4. I Expect to Learn Two Ways Out	**.811**	-.159	-.118	.169
5. I Intend to Know Tow Ways Out	**.828**	-.190	-.081	.188
6. I Want to Evacuate	**.760**	-.223	-.110	.319
7. I Expect to Evacuate	**.804**	-.203	-.083	.224
8. Knowing Two Ways Out is Beneficial	**.850**	-.144	-.046	.128
9. Knowing Two Ways Out is Important	**.834**	-.124	-.012	.081
10. Evacuating is Convenient	.515	.195	-.182	.128

Table 15 (cont)

Question	Component			
	1	**2**	**3**	**4**
11. Evacuating is Critical	**.787**	-.121	-.064	.060
12. Knowing Two Ways Out is Useful	**.826**	-.067	-.058	.094
13. Knowing Two Ways Out is Advantageous	**.716**	.024	-.093	.049
14. Evacuating is Important	**.826**	-.098	-.058	.022
15. Evacuating is Objectionable	-.174	-.512	.374	-.116
16. People Important Think I Should Know Two Ways Out	.719	.098	-.113	-.139
17. Everyone Expects to Know Two Ways Out	.776	.049	.018	-.136
18. Social Pressure to Know Two Ways Out	.234	**.686**	-.504	-.044
19. Expected to Exit When Alarm Sounds	.733	.010	.014	-.233
20. Social Pressure to Exit	.245	**.652**	-.500	-.050
21. People Important Think I Should Evacuate	.767	.025	-.015	-.279
22. Confident I Can Learn Two Ways Out	**.833**	-.050	.062	-.230
23. Easy to Know Two Ways Out	**.815**	-.002	.078	-.289
22. Confident I Can Evacuate	**.812**	-.087	.162	-.264
24. It is Easy for Me to Evacuate	.671	.095	.122	-.377
25. I Control Knowing Two Exits	.726	.175	.283	-.241
26. It is Entirely Up to Me to Know Two Ways Out	.510	.429	.445	.057
27. I Control Evacuating	.398	.522	.521	.296
28. It is Entirely Up to Me to Evacuate	.338	.540	.515	.306

[a] 4 components extracted.

Estimate of Reliability

An estimate of reliability using Cronbach's Alpha was used to check the internal consistency and if the constructs grouped together as expected. The design of the

instrument used concepts proposed by Ajzen (2006) in *Constructing a TPB Questionnaire: Conceptual and Methodological Considerations* and Francis et al. (2004) in *Constructing Questionnaires Based on the Theory of Planned Behavior: A Manual for Health Service Researchers*. The survey attempted to measure behavioral intention by looking at four dimensions proposed by Ajzen (2006), generalized intention to perform the behavior, the students' attitudes about the behavior, their feelings about how normal the behavior is (subjective norm), and their perceived control over performing the behavior. Questions 2-7 measured the generalized intention dimension, questions 8-15 measured the attitude dimension, questions 16-21 the subjective norm dimension, and questions 22-28 the perceived behavioral control dimension. Table 16 shows the Cronbach's Alpha for each dimension and for all dimensions combined for this study.

Table 16

Reliability Analysis

Dimension	Cronbach's Alpha	Number of Items
Generalized Intention	.927	6
Attitude Dimension	.699	8
Attitude Dimension without reverse coding item 15	.852	8
Subjective Norm	.747	6
Perceived Control	.852	8
All Dimensions Combined	.920	28
All Dimensions Combined without reverse coding item 15	.931	28

The reliability of each dimension was very good. The lowest was the attitude dimension with a Cronbach's Alpha of .699. Because of concern about the reverse coding and the participant's unusual responses to that item, it was recalculated without the reverse coding and the Alpha increased. The lowest reliability that could not be explained by reverse coding errors or some other factor was for the subjective norm dimension with a Cronbach's Alpha of .747. When all the dimensions were combined, the Cronbach's Alpha (.920 and .931) was very high indicating the survey seemed to be measuring related responses (see Table 17). In simple terms, if someone answered that they strongly agree with an intention to perform a safe behavior in a fire, they also agreed with the other survey items about positive fire safe behaviors throughout the survey. The lowest correlation within a dimension was within the items focused on the subjective norm.

Comparison of Mean Total Scores

To answer the first research question, was there a significant difference in the intention to perform fire safe behaviors between students who participated in a formal fire safety learning experience led by a peer educator compared to one led by an authority figure, a T test was performed. Some of these students received lecture style learning experiences, while other had experiential learning elements added. The results shown in Tables 17 and 18 indicate that there was not a significant difference between the RSFSBS mean total score for peer educators (3.5239) and authority figures (3.5697) at the .05 significance level.

Table 17

Descriptive Statistics of RSFSBS Total Score

	Educator	*N*	*M*	*SD*	Std. Error Mean
Total Score	Peer (RA)	345	3.5239	.40107	.02159
	Authority Figure (GFD)	305	3.5697	.36104	.02074

Table 18

Independent Samples Test RSFSBS Total Score (Peer Educator vs. Authority Figure)

			TotalScore	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	*F*		6.656	
	Sig.		.010	
t-test for Equality of Means	*t*		-1.519	-1.529
	df		646	645.601
	Sig. (2-tailed)		.129	.127
	Mean Difference		-.04578	-.04578
	Std. Error Difference		.03015	.02994
	95% Confidence Interval of the Difference	Lower	-.10497	-.10457
		Upper	.01342	.01302

Similarly, to determine if there was a significant difference in the intention to perform fire safe behaviors between students who participated in a fire safety learning experience that included an experiential learning component in addition to lecture compared to students who participated in a fire safety learning experience that did not include the experiential component. The results shown in Tables 19 and 20 indicate that there was not a significant difference between the mean total score for participants who received only lecture (3.5499) compared to students whose learning experience contained experiential learning elements (3.5402) at the .05 significance level.

Table 19

Descriptive Statistics of RSFSBS Total Score

	Teaching Method	*N*	*M*	*SD*	Std. Error Mean
Total Score	Lecture Only	344	3.5499	.38455	.02073
	Experiential Learning	306	3.5402	.38237	.02193

Table 20

Independent Samples Test RSFSBS Total Score (Lecture Only vs. Experiential Learning)

			TotalScore	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	*F*		.217	
	Sig.		.641	
t-test for Equality of Means	*t*		.324	.324
	df		646	637.100
	Sig. (2-tailed)		.746	.746
	Mean Difference		.00977	.00977
	Std. Error Difference		.03010	.03018
	95% Confidence Interval of the Difference	Lower	-.04951	-.04949
		Upper	.06906	.06904

Factorial Analysis of Variance

Finally, an analysis of variance (ANOVA) was used to determine if there was a significant difference between the mean survey scores for the four combinations of intervention types. The four different intervention types included a peer educator using strictly lecture educational techniques. The peer was the Resident Assistant (RA) assigned to their floor, and this was abbreviated as an RAL intervention. When the RA added experiential learning techniques to the intervention, it was called an RAE

intervention. The same naming convention was used for interventions that were conducted by authority figures, in case uniformed firefighters from the municipal fire department (MFD) resulting in a MFDL and MFDE intervention types. Of the 650 residential students who responded, 183 (28%) received a RAL intervention, 163 (25%) a RAE intervention, 164 (25%) a MFDL intervention and 140 (22%) a MFDE intervention. The difference in sample population sizes was due to random assignment of interventions and the various levels of attendance on the various floors on the residence hall. The results displayed in Tables 21 and 22 indicate that while the mean total scores for the treatment groups are different, they are not significantly different at alpha equal to .05. The total mean scores were higher for the interventions that used experiential learning techniques to supplement the lecture material.

Table 21

Descriptive Statistics of RSFSBS Total Score

Intervention Type	***N***	***M***	***SD***	**Std. Error**
RAL	181	3.5327	.37991	.02824
RAE	163	3.5691	.38992	.03054
MFDL	164	3.5143	.42416	.03312
MFDE	140	3.5705	.32560	.02752
Total	648	3.5453	.38326	.01506

Table 22

One Way Analysis of Variance (ANOVA) of RSFSBS Total Score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.367	3	.122	.833	.476
Within Groups	94.671	644	.147		
Total	95.039	647			

Additional Analysis

An additional analysis was performed to determine if there was a significant difference in the intention to perform fire safe behaviors, based on their RSFSBS total score, between males and females. The results shown in Tables 23 and 24 indicate that there was a significant difference between the mean total score for male participants (3.5006) and female students (3.5672) at the .05 significance level, $t(645) = 2.012$, $p = .045$.

Table 23

Descriptive Statistics of RSFSBS Total Score

	Sex	***N***	***M***	***SD***	**SE Mean**
Total Score	Male	213	3.5006	.40765	.02793
	Female	434	3.5672	.36967	.01774

Table 24

Independent Samples Test RSFSBS Total Score (Male vs. Female)

			TotalScore	
			Equal variances assumed	**Equal variances not assumed**
Levene's Test for Equality of Variances	*F*		4.490	
	Sig.		**.034**	
t-test for Equality of Means	*t*		-2.080	**-2.012**
	df		645	386.801
	Sig. (2-tailed)		.038	**.045**
	Mean Difference		-.06657	-.06657
	Std. Error Difference		.03201	.03309
	95% Confidence Interval of the Difference	Lower	-.12942	-.13163
		Upper	-.00372	-.00151

Descriptive statistics for residential student participants were developed to compare the sample population to the institution's student population. A confirmatory factor analysis and an estimate of reliability were used to recheck the reliability of the Residential Student Fire Safety Behavior Survey (RSFSBS). A comparison of total mean scores and a factorial analysis of variance were conducted to determine if there was a significant difference between the four intervention types. Results were obtained for each test and can be compared to the theoretical assumptions about the students and their intended behavior changes related to fire safety following the interventions.

CHAPTER V

DISCUSSION

Introduction

Keeping residential students safe from the dangers of fire is an ongoing priority for parents, college environmental health and safety professionals, and college housing leaders. However, little research into how to effectively influence the safety related behavior choices of residential students has been conducted. Convincing students to undertake certain behaviors has been the focus of most fire safety programs for residential students, but measuring the success of various methods of educating residential students has only been anecdotal at best.

To decide what methods of education might be most effective for the current generation of students, often referred to as Millennial students, literature was consulted to determine if any unique learning characteristics might be considered. Studies have indicated that peer educators are most effective at influencing students about health related behaviors, but by contrast Millennial students are said to follow the advice of and trust authority figures more than previous generations. Students of the Millennial generation are also said to value experiential and interactive learning experiences more. These characteristics were explored in detail in this study.

The specific purpose of this research was to identify teaching methods that influenced students to choose safer behaviors related to fire safety. Success was be

determined by predicting behavior change using the Theory of Planned Behavior (TPB, Ajzen, 1991). Whether the educational experience was able to influence fire safety behaviors was explored by measuring the students' generalized intention to perform the safer behaviors, their attitudes toward the behaviors, their perceived ability to control the behaviors, and how normal they believed the behaviors to be. This study was designed to see if there was a significant difference in the intention to perform fire safe behaviors between students who participated in a formal fire safety learning experience led by a peer educator versus students who participated in the same learning experience led by an authority figure. In addition, it was designed to determine if there was a significant difference in the intention to perform fire safe behaviors between students who participated in a formal fire safety learning experience that included an experiential learning components and students who participated in the same formal fire safety learning experience that did not include the experiential educational components.

A survey instrument was developed using the TPB as a model for determining behavioral intent related to the two specific fire safety behaviors of knowing two exits from one's residence and exiting when a fire alarm sounds. The instrument, the Residential Student Fire Safety Behavior Survey (RSFSBS), was used to determine which particular type of intervention was more likely than the other to influence fire safety behavior in the future. The survey contained 28 scored questions which could be responded to with either a one (strongly disagree), two (disagree), three (agree), or four (strongly agree). A higher score would indicate a respondent is more likely to perform

desired fire safe behaviors. Scores for the test were averaged to determine a mean total score for each intervention type.

Findings

Preliminary Analysis

The RSFSBS was developed to measure behavior intentions of residential students related to fire safety using Ajzen's (1991) TPB as a basis for predicting behavior (Appendix B). The design of the instrument used concepts proposed by Ajzen (2006) and presented in how-to format in Francis et al. (2004) in *Constructing Questionnaires Based on the Theory of Planned Behavior: A Manual for Health Service Researchers*. The survey measured behavioral intention by considering the four dimensions proposed by Ajzen (2006), generalized intention to perform the behavior, the students' attitudes about the behavior, their feelings about how normal the behavior is (subjective norm), and their perceived control over performing the behavior. The instrument measured behavioral intention in the four dimensions using a four point Likert scale, with the scale covering strongly disagree to strongly agree. Analysis of responses to this study indicates that the RSFSB survey is a reliable and valid instrument. The reliability was confirmed, as four factors explained the variance in responses and these aligned with the four sections of the survey that were designed to measure each of the TPB's four predictor dimensions. There was a problem noted with one question that was reverse coded and it showed variance that was not consistent with the rest of the survey questions. The survey should be modified for future use by adding additional reverse coded questions in hopes of forcing participants to read each question more closely. With only one reverse coded question, it

is probable that students who did strongly agree and were likely to behave with fire safety in mind did not answer this one question consistent with their other responses.

The subjective norm dimension, while reliable, did show less reliability compared to the other dimensions. The survey questions asked about how the respondents felt others important to them viewed fire safety and how the referents expected them to act in a fire emergency. One explanation could be the wording of the questions, but this also points out that possibly the greatest difference among the residential students was their perceptions of what is considered normal fire safety behavior among their peers and others that care about them. In other words, they expect to perform fire safety related behaviors, such as knowing two exits and exiting when the alarm sounds (generalized intent), they believe it is the right thing to do (attitudes about the behavior), they believe they can perform the actions (perceived control over performing the behavior), but they are not all sure what is considered normal behavior (subjective norm). This could be because they have not discussed this topic openly and greater exploration and understanding of this question could prove beneficial in improving subsequent fire safety education and fire safety behavior.

Research Question Analysis

What factors in a learning experience are likely to influence the behavior of Millennial students related to fire safety? Often, health related behaviors are most influenced by peer educators (Brack, Millard, & Shah, 2008; Stein, 2007). Debard (2004) and Taylor and Keeter (2010) posit that Millenials are most influenced by authority figures. However, the results of this study did not indicate a significant difference

between types of educators on students predicted fire safe behaviors, which included knowing two exits, and exiting during a fire alarm. The students who received the training from a firefighter had a slightly higher average score, but it was not enough to be significant, even with the large sample population of 650 residential students.

Junco (2007) and Oblinger and Oblinger (2005) indicate that Millennial students prefer experiential learning experiences and would likely respond better to them as they are more comfortable with this type of learning environment. The results of this study do not support this when looking at the specific topic of fire safety. The mean total score was only .0097 points different on a four point scale and this was not significant even with 650 students in the sample population.

Combination Analysis

Further analysis was conducted on the survey data to determine if one combination of the four intervention types showed a significant influence on the students' scores on the RSFSBS. The four different intervention types included a peer educator using strictly lecture educational techniques. The peer was the RA assigned to the floor, and when the RA added experiential learning techniques to the intervention a second combination was created. Uniformed firefighters from the municipal fire department (MFD) presented the same information with either lecture only or by adding experiential learning techniques which created two more combinations. The mean scores on the RSFSBS where between 3.5143 and 3.5705 for the four intervention types and this was not a significant difference. Even with the large sample population, the type of intervention did not have a significant impact on the scores of the students. The mean

scores were all positive representing that students either agreed or strongly agree with dimensions predicting that they intended to act in a fire safe way regardless of who was presenting the fire safety information or whether they received a lecture or a more interactive intervention.

Additional Analysis

Although not initially considered a potential factor in the students' RSFSBS score, the respondent's sex was analyzed to see if it had an impact. The mean total score for females taking the RSFSBS after any of the interventions was significantly higher than the score for male students. Both scores were higher than 3.5, indicating an overall intention to act in a consistent manner with the fire safety training they had just received.

Limitations

Limitations of the study were largely created by practical realities of capturing a large sample population without greatly altering the actual training students at this institution were already receiving. This was considered an important consideration so that lessons from this experience would be more directly relatable to practice. For example, the learning experience was designed to be only ten minutes long, so this could have limited the ability of any learning experience type or educator to have a significant influence on the behavioral intention of the students. However, the reality of the situation was that ten minutes is all that is devoted to fire safety at the first hall meeting, as many aspects of residence hall life must be covered with the new students in a relatively short time, under an hour and a half. In order to maximize attendance at the first floor meeting where the training was included, all meetings occur at the same time. This introduced the

limitation that multiple educators had to be utilized and this introduced the possibility of variation in delivery. Although this was minimized with training for each educator and a very specific outline for the intervention type, the limitation still existed (Appendices C and D). The physical learning environment was another condition limited by the practical reality of having all of the meetings at the same time. Lacking sufficient meeting space on each floor, the first floor meetings were held in the hallway. This might not be the most ideal learning environment, but is the only option available when all meetings are held at the same time. These real world concessions may not have created the perfect research environment, but they did add some credibility to the results because the study was conducted in condition that will be likely encountered by practitioners in the field.

Specific residence halls were chosen because they have a large number of first-year, traditional age students. While this was the desired population for this study, it does present a limitation as 76% of the respondents were 18 years old, with 91% being 18 or 19 years old. A large majority of the residential students were also first or second year students, 90%, with 76% being in their first year. It is important to consider that very few older or upper class students were part of the study and therefore, the results may not be applicable to them. For example, they might have different relationships with RA's or see firefighters in a different role after their experiences in college.

The methodology used for this study did not develop a baseline for the students' intended behavior related to fire safety. It is possible that the training had no influence and the students arrived on campus with a strong concern about their safety and knew what actions to take in support of that concern. A pre-test, post-test methodology to

determine if the fire safety education was helping to change behaviors would have given an updated perspective on Barrows and Thurman (1988) conclusions that students arrived on campus relatively little fire safety knowledge.

Implications for Practice

The results of this study can inform practice in fire safety training and education efforts for residential students even as the further research considers the implications of these results. Since it appears that neither RA's nor firefighters are more likely to significantly influence the behaviors of students that attend their fire safety training, residence hall administrators can feel free to choose either as an educator. The choice can depend more on other factors of convenience, such how difficult it might be to arrange firefighters to attend meetings, or whether it is important to improve the relationship with the local fire department by seeking their involvement in solving a problem such as excessive false alarms. In addition, attempting to offer information about fire safety by more diverse methods than simple lecture may not be required to see positive results. However, with the possibility that Ajzen's subjective norm dimension shows the most variance among residential students, it might be important to continue to use interactive and experiential techniques in order to stimulate discussion and help students discover how their peers and other feel about fire safety behaviors. Fishbein and Ajzen (2010) indicate that, once a dimension like subjective norms is identified as being less consistent with general intent, this should be where the intervention is adjusted. They do not offer clear way to do this for all types of behaviors, so further study in this area is needed. Until this is attempted in further research, practitioners should continue to try various

methods to improve students' understanding of their referent's beliefs and actions, hoping to influence positive behavior intentions.

Because of the high scores on generalized intention and beliefs dimensions, it appears that most students believe that acting consistent with fire safety guidance is appropriate, but it does not appear that this is shared with peers so as to make it a normal behavior. Perkins (2009) social norm approach would push for education efforts to express the actual social norms that most students believe it is normal to behave in a safe manner. Perkins would encourage this to be taught using positive images of students engaging in appropriate behaviors and suggested that scare tactics be avoided, as they can reinforce false social norms and have a negative impact.

Implications for Future Research

Future studies may consider using similar elements (peer vs. expert; lecture vs. experiential) but use a pre-test, post-test methodology to determine if the training was helping to change behaviors or if the students arrived at their residence hall with the intent to perform safe behaviors. A major benefit of this study was the development of the RSFSBS. It was piloted once, slightly altered and then used again with a large sample population. The instrument proved reliable in both instances and could be used for future research as is or slightly modified in hopes of improving reliability, specifically in measuring the subjective norm dimension.

Another element worth investigating is the integration of video into the fire safety education. Millennial students are believed to respond positively to visual instruction methods and particularly those using technology and modern delivery methods including

online video sites such as YouTube. Prensky (2001) believes the visual graphical nature of digital media, where words are only used as subtext for details, is unique and different from pre-digital ways of sharing information.

The results of the pilot study indicated that the subjective norm dimension might be improved with wording changes. This was done for the final instrument used in this study. The possibility of increasing the number of items in this dimension to include two more items that favored family as a locus for subjective norms and several more that favored peers as that locus was also a possibility. This was not attempted as the instrument already contained 34 items, and it was believed that adding more items might reduce response rate or quality. It will be more important for future research to focus on just the subjective norm dimension and how to influence it through education and thus improve intended fire safety behaviors of residential students. A qualitative study looking at residential student meanings related to the subjective norm dimension might reveal more effective language for surveying and more importantly better understanding of this important factor will help better inform future interventions. Fishbein and Ajzen (2010) have recently written that subjective norms can be further described as either injunctive, perceptions about what should be done, or descriptive, perceptions that others are performing the behavior. These distinctions should be considered in future interventions and possibly survey instrument items.

Further related research could also consider the social norms approach as expressed by Perkins (2003). While this theory was originally advanced in relationship to substance abuse prevention, it is a health intervention method that could be adapted to

fire safety education with the hope of allowing students to better understand the social norms of their peers related to fire safety behaviors. The theory is that students' perceived beliefs about the social norms of their peers are not consistent with their peers' actual norms. This inconsistency leads students to act in ways they believe are consistent with what they believe are their peers' norms, not their actual norms. For example, if a student believes that all of his peers drink excessively on the weekends, he is more likely to be convinced this is what is expected by peers, even though the actual number of peers who actually do this or think it is appropriate is much lower. If the student was aware that most of his peers did not believe this unhealthy behavior to be normal, then he would be less likely to engage in it. If there is confusion among students about the social norms related to fire safety, possibly exposing them to actual norms could improve actual fire safety behaviors. The overall positive responses on the survey instruments can be the basis for communicating to students that high percentages of their peers believe it is important to exit during a fire alarm and know to exits from anywhere they sleep, and in general that most of them will act in a safe, responsible way in a fire.

Conclusion

Fires continue kill and injure college students, with six more fatalities reported during the most recent academic year (Campus Firewatch, 2011). Efforts to reduce or eliminate these campus tragedies have continued, yet little published research has appeared since 1988 when Barrows and Thurman reported that residential students perceived they had more knowledge about fire safety than they actually did and their conclusions included that more research was needed. Education and training, along with

engineering controls, continue to be the primary focus of college environmental health and safety professionals and college housing professionals.

The findings of this research suggests that regardless of whether a peer or an authority figure delivers fire safety training, residential students intend to behave consistent with the training. Adding experiential learning elements to a traditional lecture did not seem to change intended behaviors. Combinations of these various intervention elements did not produce a clear cut best way of presenting fire safety information. Reviewing the reliability of the survey instrument did show more variance in the way residential students responded to items related to their subjective norms related to fire safety.

Future research focused on better understanding the subjective norms of residential students concerning fire safety should prove important for changing students' behaviors that will help them avoid injury or death from a fire. Confirming that there are significant differences would be the first step, then follow-up should consider what appropriate norms would be and then finally how to adjust intervention strategies in order to improve behavioral intentions.

REFERENCES

Adams, R. C. (Ed.) (1983). *Fire safety educator's handbook.* Quincy, MA: National Fire Protection Association.

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action control: From cognition to behavior* (pp. 11-39). New York: Springer.

Ajzen, I. (1988). Attitudes, personality, and behavior. Chicago, IL: Dorsey Press.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior & human decision processes, 50,* 179-211.

Ajzen, I. (2006). *Constructing a TpB questionnaire: Conceptual and methodological considerations.* Retrieved from http://www.people.umass.edu/aizen/pdf/tpb.measurement.pdf

Ajzen, I. (n.d.). *Behavioral interventions based on the theory of planned behavior.* Retrieved from http://www.people.umass.edu/aizen/pdf/tpb.intervention.pdf

Ajzen, I. (n.d.). *Frequently asked questions.* Retrieved from http://www.people.umass.edu/aizen/faq.html

Ajzen, I., & Fishbein, M. (2005). The influence of attitudes on behavior. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *The handbook of attitudes* (pp. 173-221). Mahwah, NJ: Erlbaum.

American Society of Safety Engineers, Fire Protection Practice Specialty. (2009, September). *How to prevent on/off-campus fires, ASSE fact sheet 2.* Retrieved from http://www.asse.org/newsroom/safetytips/docs/onoffcampusfiresafety2_91009.pdf

American Society of Safety Engineers, Fire Protection Practice Specialty. (2009, September). *Fire escape planning: What to do in case of a fire, ASSE fact sheet3.* Retrieved from http://www.asse.org/newsroom/safetytips/docs/onoffcampusfiresafety3_91009.pdf

American Society of Safety Engineers, Fire Protection Practice Specialty. (2009, September). *Fire safety equipment for off-campus and Greek housing, ASSE fact sheet 4.* Retrieved from http://www.asse.org/newsroom/safetytips/docs/onoffcampusfiresafety4_91009.pdf

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40,* 471-499.

Barrows, C.W., & Thurman, Q. (1988). Fire safety on campus: Are college students prepared? *College Student Journal, 22,* 310-314.

Bennett, S., Maton, K., & Kervin, L. (2008). The "digital natives" debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775-786. doi:10.1111/j.1467-8535.2007.00793.x

Brack, A. B., Millard, M., & Shah, K. (2008). Are peer educators really peers? *Journal of American College Health, 56,* 566-568.

Brooks-Harris, J. E., & Stock-Ward, S. R. (1999). *Workshops: Designing and facilitating experiential learning.* Thousand Oaks, CA: Sage.

Campus Fire Safety Right-to-Know Act of 2006, S. 2493, 109th Congress. (2006).

Campus Firewatch. (2011). *Fatal campus fires.* Retrieved from http://www.campus-firewatch.com/resources/resource%20center/fatalcampusfires.html

Chickering, A.W. (1977). *Experience and learning: An introduction to experiential learning*. New Rochelle, NY: Change Magazine Press.

Chickering, A.W., & Reisser, L. (1993). *Education and identity* (2nd ed.). San Francisco, CA: Jossey-Bass.

Coomes, M. D., & DeBard, R. (Eds.). (2004). *Serving the millennial generation* (Vol. 106). San Francisco, CA: Jossey-Bass.

Cote, A. E., Grant, C. C., Hall, J. R. Jr., Solomon, R. E., & Francis, J. J. (Eds.). (2008). *Fire protection handbook* (20th ed.). Quincy, MA: National Fire Protection Association.

DeBard, R. (2004). Millennials coming to college. In M. D. Coomes & R. DeBard (Eds.), *Serving the millennial generation* (Vol. 106, pp. 33-45). San Francisco, CA: Jossey-Bass.

Farrell, E. F. (2005, June 3). Legislators propose fire-safety bills. *The Chronicle of Higher Education.* Retrieved from http://chronicle.com

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York: Taylor and Francis Group.

Francis, J. J., Eccles, M. P., Johnston, M., Walker, A., Grimshaw, J., Foy, R., Kaner, E. F. S., Smith, L., & Bonetti, D. (2004). *Constructing questionnaires based on the theory of planned behavior: A manual for health service researchers*. Newcastle upon Tyne, U.K.: University of Newcastle, Centre for Health Services Research. Retrieved from http://www.rebeqi.org/ViewFile.aspx?itemID=212

Francis, S., Siditsky, R., Bealafeld, M., & Clark, R. (2009, June). *Only you can prevent campus fires: Interactive fire safety training for RAs and residents*. Paper session presented at the meeting of Association of College & University Housing Officers—International, Baltimore, MD.

Higher Education Opportunity Act, 20 U.S.C. 1001§ (2008).

Howe, N., & Strauss, B. (2000). *Millennials rising: The next great generation.* New York: Vintage Books.

Howe, N., & Strauss, W. (2007). *Millennials go to college: Recruiting and admissions, campus life, and the classroom* (2nd ed.). Falls Church, VA: LifeCourse Associates.

How to prevent on- and off- campus fires. (2005, November). *College Planning & Management.* Retrieved from http://www.peterli.com/cpm/resources/articles/archive.php?article_id=1579

Junco, R. (2007). *Connecting to the net generation: What higher education professionals need to know about today's students.* Waldorf, MD: National Association of Student Personnel Administrators (NASPA).

Junco, R., & Cole-Avent, G. A. (2008). An introduction to technologies commonly used by students. *New Directions for Student Services, 124,* 3-17. doi:10.1002/ss

Kennedy, M. (2007). Fire/life safety: Schools and universities must be vigilant to minimize hazards and protect students, staff and property. *American School & University, 79*(9), 14.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Englewood Cliffs, NJ: Prentice Hall.

Longcore, W., & Rossiter, J. (2008, June). New approaches to fire safety training. Paper session presented at the meeting of Association of College & University Housing Officers—International, Lake Buena Vista, FL.

Matthew, K. (2007, October). *Life safety networks—A parallel network approach.* Paper session presented at the meeting of the Association of College & University Housing Officers—International, IT Conference, Virginia Beach, VA. Retrieved from http://prestohost08.inmagic.com/inmagicgenie/catFiles/2007/11/602.ppt

Milshtein, A. (2008, February). Where's the fire? *College Planning & Management.* Retrieved from http://www.peterli.com/cpm/resources/articles/archive.php?article_id=1722

Monikowski, F., & Gray, T. (2009, June). *Life safety for on and off campus housing can you afford it? How can you not?!* Paper session presented at the meeting of Association of College & University Housing Officers—International, Baltimore, MD. Retrieved from: http://prestohost08.inmagic.com/inmagicgenie/catfiles/2009/07/ACUHO-I%2009.updated.pdf

Mowrer, F. W. (1999). *Fire safe student housing: A guide for campus housing administrators.* College Park: University of Maryland Department of Fire Protection Engineering. Available: http://www.usfa.fema.gov/downloads/pdf/publications/9-1624.pdf

Newton, F. B., & Ender, S. C. (2010). *Students helping students: A guide for peer educators on college campuses* (2nd ed.). San Francisco, CA: Jossey-Bass.

Oblinger, D. (2003). Boomers, gen-xers, and millennials: Understanding the new students. *EDUCAUSE Review, 38*(4), 37-47. Retrieved from http://net.educause.edu/ir/library/pdf/ERM0342.pdf

Oblinger, D., & Oblinger, J. (2005). Is it age or IT: First steps toward understanding the net generation. In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the net generation* (pp. 2.1-2.20). Washington, DC: EDU-CAUSE. Retrieved from http://net.educause.edu/ir/library/pdf/pub7101.pdf

Perkins, H. W. (2003). *The social norms approach to preventing school and college age substance abuse*. San Francisco, CA: Jossey-Bass.

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6.

Raterman, S. M. (1996). Methods of control. In B. A. Plog, , J. Niland, & P. J. Quinlan (Eds.), *Fundamentals of industrial hygiene* (4th ed., pp. 531-553). Chicago, IL: National Safety Council.

Shervington, D. (2008, October). *General safety in residence hall buildings*. Paper session presented at the meeting of Association of College & University Housing

Officers—International and APPA The Association of Higher Education Facilities Officers, Joint Housing Facilities Conference, Dallas, TX.

Skiba, D. J. & Barton, A. J. (2006, May). Adapting your teaching to accommodate the net generation of learners. *OJIN: The Online Journal of Issues in Nursing, 11*(2), Manuscript 4. Retrieved from http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume112006/No2May06/tpc30_416076.aspx

Smalley, T. (1983). Marketing. In R.C. Adams (Ed.), *Fire safety educator's handbook.* (pp. 43-118). Quincy, MA: National Fire Protection Association.

Stein, J. L. (2007). Peer educators and close friends as predictors of male college students' willingness to prevent rape. *Journal of College Student Development, 48*(1), 75-89.

Ta, V. M., Frattaroli, S., Bergen, G., & Gielen, A.C. (2006). Evaluated community fire safety interventions in the United States: A review of current literature. *Journal of Community Health, 31*(3), 176-97. doi:10.1007/s10900-005-9007-z

Taub, D. J. (2008). Exploring the impact of parental involvement on student development. *New Directions for Student Services*, 122, 15-28. doi:10.1002/ss.272

Taub, D. J., & Servaty-Seib, H. L. (2008). Developmental and contextual perspectives on bereaved college students. *New Directions for Student Services*, 121, 15-26. doi:10.1002/ss.263

Taylor, P. & Keeter, S. (Eds.). (2010, February). *Millennials: A portrait of generation next*. Washington, DC: Pew Research Center. Retrieved from http://pewresearch.org/millennials/

U.S. Department of Education, Office of Postsecondary Education, (2009). The Campus Security Cutting Tool. Retrieved from http://ope.ed.gov/security/Index.aspx

U.S. Department of Homeland Security, U.S. Fire Administration. (2006, March). *Fire Safety 101: A factsheet for colleges and universities.* Retrieved from http://www.usfa.dhs.gov/downloads/pdf/fswy8.pdf

U.S. Department of Homeland Security, Federal Emergency Management Agency, U.S. Fire Administration National Fire Data Center. (2009, November). *University housing fires.* Retrieved from http://www.usfa.dhs.gov/downloads/pdf/tfrs/v10i1.pdf

U.S. Department of Homeland Security, Federal Emergency Management Agency. (2008, June). *Public fire education planning: A five step process.* Publication No. FEMA FA-219.

Wilson M. E. (2004). Teaching, learning, and millennial students. In M. D. Coomes & R. DeBard (Eds.), *Serving the millennial generation* (Vol. 106, pp. 59-71). San Francisco, CA: Jossey-Bass.

Windham, C. (2005). The student's perspective. In D. G. Oblinger & J. L. Oblinger (Eds.), Educating the net generation (pp. 5.1-5.15). Washington, DC: EDU-CAUSE. Retrieved from http://net.educause.edu/ir/library/pdf/pub7101.pdf

APPENDIX A

THE PILOT RESIDENTIAL STUDENT FIRE SAFETY BEHAVIOR SURVEY INSTRUMENT

Residential Student Fire Safety Behavior Survey (RSFSBS)

Last four digits of your student identification number_____

Please answer the following demographic questions.

A) What sex do you identify as?

1--- Male **2**--- Female

☐ 1 ☐ 2

B) What is your age in years?

_____

C) What year are you in college?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+

D) Which race do you identify as?

1--- Black **2**--- Asian/Pacific Islander **3**--- Hispanic/Latino **4**---Native American **5**--- White

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

E) Do you live in a university residence hall?

1--- Yes **0**--- No

☐ 1 ☐ 0

PLEASE TURN THE PAGE OVER AND COMPLETE THE SURVEY. THANK YOU.

Residential Student Fire Safety Behavior Survey (RSFSBS)

Instructions: This survey asks about your thoughts and opinions related to fire safety behaviors. For the following items, please indicate how much you agree with each statement. There are no right or wrong answers; just give your own honest opinion, rather than how you think others would answer.

1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Fire safety knowledge is important for college students.	1	2	3	4
2. I want to know two ways to escape from my residence building in a fire.	1	2	3	4
3. I intend to exit my residence immediately when a fire alarm sounds, even if I am in bed.	1	2	3	4
4. I expect to learn two ways out of a new building I sleep in.	1	2	3	4
5. I intend to be aware of two ways to exit the building I live in.	1	2	3	4
6. I want to evacuate my residence whenever the fire alarm sounds.	1	2	3	4
7. I expect to evacuate the residence I am sleeping in, whenever the fire alarm sounds.	1	2	3	4
8. Knowing two ways to exit from a residence is beneficial.	1	2	3	4
9. Knowing two ways to escape from a residence is important.	1	2	3	4
10. Evacuating when the fire alarm sounds is convenient.	1	2	3	4
11. Evacuating when the fire alarm sounds is critical for my safety.	1	2	3	4
12. Knowing two ways to escape from a residence is useful.	1	2	3	4
13. Knowing two ways to exit from a residence is advantageous.	1	2	3	4
14. Evacuating when the fire alarm sounds is important.	1	2	3	4
15. Evacuating when the fire alarm sounds is unpleasant (for me).	1	2	3	4
16. Most people who are important to me think that I should know two ways of the building I sleep in.	1	2	3	4
17. It is expected of me that I know two exits from my residence.	1	2	3	4
18. I feel social pressure to know two different ways to exit my residence.	1	2	3	4
19. It is expected that I exit the building when the fire alarm sounds.	1	2	3	4
20. I feel social pressure to exit my residence when the fire alarm sounds.	1	2	3	4
21. Most people who are important to me think that I should leave my residence when the fire alarm activates.	1	2	3	4
22. I am confident that I could learn two ways out of my residence.	1	2	3	4
23. For me, it is easy for me to know two exit paths from my residence.	1	2	3	4
22. I am confident that I can evacuate a building when the fire alarm sounds.	1	2	3	4
24. It is easy for me to leave the building I sleep in when the fire alarm sounds.	1	2	3	4
25. I can control knowing how to exit from my residence by two different ways.	1	2	3	4
26. It is entirely up to me if I learn two ways out from the building where I sleep.	1	2	3	4
27. I can control if I leave my residence when the fire alarm activates.	1	2	3	4
28. It is entirely up to me if I leave the building I am sleeping in when the alarm activates.	1	2	3	4
	Strongly Disagree	Disagree	Agree	Strongly Agree

APPENDIX B

THE RESIDENTIAL STUDENT FIRE SAFETY BEHAVIOR SURVEY INSTRUMENT

Residential Student Fire Safety Behavior Survey (RSFSBS)

Please answer the following demographic questions.

A) What sex do you identify as?

1--- Male **2**--- Female

○ 1 ○ 2

B) What is your age in years? _____

C) What year are you in college?

○ 1 ○ 2 ○ 3 ○ 4 ○ 5+

D) Which ethnicity/race do you identify as?

1--- Hispanic **2**--- Latino **AND Select one or more:** **1**--- American Indian or Alaska Native **2**--- Asian

○ 1 ○ 2 ○ 1 ○ 2

3--- Black or African American **4**--- Native Hawaiian or Other Pacific Islander **5**--- White

○ 3 ○ 4 ○ 5

E) What is your room number? _____

Residential Student Fire Safety Behavior Survey (RSFSBS)

Instructions: This survey asks about your thoughts and opinions related to fire safety behaviors. For the following items, please indicate how much you agree with each statement. There are no right or wrong answers; just give your own honest opinion, rather than how you think others would answer.

1 = Strongly Disagree 2 = Disagree 3 = Agree 4 = Strongly Agree	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Fire safety knowledge is important for college students.	1	2	3	4
2. I want to know two ways to escape from my residence building in a fire.	1	2	3	4
3. I intend to exit my residence immediately when a fire alarm sounds, even if I am in bed.	1	2	3	4
4. I expect to learn two ways out of a new building I sleep in.	1	2	3	4
5. I intend to be aware of two ways to exit the building I live in.	1	2	3	4
6. I want to evacuate my residence whenever the fire alarm sounds.	1	2	3	4
7. I expect to evacuate the residence I am sleeping in, whenever the fire alarm sounds.	1	2	3	4
8. Knowing two ways to exit from a residence is beneficial.	1	2	3	4
9. Knowing two ways to escape from a residence is important.	1	2	3	4
10. Evacuating when the fire alarm sounds is convenient.	1	2	3	4
11. Evacuating when the fire alarm sounds is critical for my safety.	1	2	3	4
12. Knowing two ways to escape from a residence is useful.	1	2	3	4
13. Knowing two ways to exit from a residence is advantageous.	1	2	3	4
14. Evacuating when the fire alarm sounds is important.	1	2	3	4
15. For me, Evacuating when the fire alarm sounds is objectionable.	1	2	3	4
16. People important to me think that I should know two ways out of the building I sleep in.	1	2	3	4
17. It is expected of me that I know two exits from my residence.	1	2	3	4
18. I feel social pressure to know two different ways to exit my residence.	1	2	3	4
19. It is expected that I exit the building when the fire alarm sounds.	1	2	3	4
20. I feel social pressure to exit my residence when the fire alarm sounds.	1	2	3	4
21. People important to me think that I should leave my residence when the fire alarm activates.	1	2	3	4
22. I am confident that I could learn two ways out of my residence.	1	2	3	4
23. For me, it is easy for me to know two exit paths from my residence.	1	2	3	4
22. I am confident that I can evacuate a building when the fire alarm sounds.	1	2	3	4
24. It is easy for me to leave the building I sleep in when the fire alarm sounds.	1	2	3	4
25. I can control knowing how to exit from my residence by two different ways.	1	2	3	4
26. It is entirely up to me if I learn two ways out from the building where I sleep.	1	2	3	4
27. I can control if I leave my residence when the fire alarm activates.	1	2	3	4
28. It is entirely up to me if I leave the building I am sleeping in when the alarm activates.	1	2	3	4
	Strongly Disagree	Disagree	Agree	Strongly Agree

APPENDIX C

OUTLINE FOR FIRE SAFETY TRAINING AT FIRST FLOOR MEETING—LECTURE ONLY

Outline for Fire Safety Training at First Floor Meeting - Lecture Only

A. Introduction and overview (30 seconds) (RA educators can skip)
    a. In the past ten years 134 college students have died in fires and many more have been burned and injured.
B. Fire Response
    a. Your new home has a fire alarm and a fire sprinkler system. They will activate during an emergency. The fire alarm for smoke, the sprinkler system, one head at a time, for actual fire.
    b. Tampering with any of this equipment is a felony and we take it very seriously. Tampering, false alarms or damaging the systems will result in a fine or imprisonment and dismissal from housing.
    c. Do not touch or hang clothes from sprinkler heads, they activate easily and you cannot imagine how much water comes out of one when opened. You will be accountable for the all the stuff that gets destroyed in the building.
C. Exit when alarm sounds – evacuate always! Not evacuating is also against the law with similar sanctions, including dismissal from housing.
    a. Use the closest exit, but have a back–up in mind. Know two exits.
    b. Gather at you floor's assembly point outside and stay put.
    c. If your door is hot and you cannot get out call the UNCG Police at 336.334.4444 and stay put.
D. Use the stairs to evacuate, not the elevator.
    a. If you have an injury that prevents evacuation, immediately ask your RA and CRL to put you on the "Evacuation Assistance List"
E. If you smell smoke, close the door, pull the alarm and evacuate the building. Call the police or use a blue light phone when you get outside.
F. Fire Prevention – Things not to do!
    a. No smoking, no candles, no incense, no halogen lamps.
    b. No cooking equipment (microwave okay), extension cords with more than four devices.

c. Do not leave anything you are cooking. Do not leave the room when you are making popcorn or even boiling water, these actions often lead to fires.
d. Keep the halls, walls, and stairs clear. No paper or plastic decorations in the hall.
e. Report broken things to HRL staff 336.334.3498 or online at SchoolDude.com under residential services

G. Know two exit routes from your residence and anywhere you stay. In an emergency one might be blocked.
H. When you leave UNCG Housing, make sure you stay somewhere with a fire alarm and fire sprinkler system. Most college student deaths occur in off-campus housing. Ask for help finding these types of housing.

APPENDIX D

OUTLINE FOR FIRE SAFETY TRAINING AT FIRST FLOOR MEETING—EXPERIENTIAL LEARNING TECHNIQUES

Outline for Fire Safety Training at First Floor Meeting - Experiential Learning Techniques

A. Introduction and overview (30 seconds) (RA educators can skip)
    a. In the past ten years 134 college students have died in fires and many more have been burned and injured.
B. Fire Response
    a. Your new home has a fire alarm and a fire sprinkler system. They will activate during an emergency. The fire alarm for smoke, the sprinkler system, one head at a time, for actual fire.
    b. Tampering with any of this equipment is a felony and we take it very seriously. Tampering, false alarms or damaging the systems will result in a fine or imprisonment and dismissal from housing.
        i. Can anyone point out the fire safety features around us? Did you notice the (maybe add fire alarm pull box, sprinkler head, self-closing stair door, fire extinguisher, if not pointed out by students)(limit to about 1 minute).
    c. Do not touch or hang clothes from sprinkler heads, they activate easily and you cannot imagine how much water comes out of one when opened. You will be accountable for the all the stuff that gets destroyed in the building.
        i. Has anyone lived in a place that has these features previously? Did it affect the way you lived? How? (limit to about 1 minute).
C. Exit when alarm sounds – evacuate always! Not evacuating is also against the law with similar sanctions, including dismissal from housing.
        i. Last year a student was removed from housing for not evacuating when the fire alarm sounded. Anyone know this person? Why would housing officials do this? Really, they want you to stay safe and care about your well being.
    b. Use the closest exit, but have a back –up in mind. Know two exits.

c. Gather at you floor's assembly point outside and stay put.
d. If your door is hot and you cannot get out call the UNCG Police at 336.334.4444 and stay put.
    i. Let's program that number our phones, if we have them. (limit to about 30 seconds and keep going)

D. Use the stairs to evacuate, not the elevator.
    a. If you have an injury that prevents evacuation, immediately ask your RA and CRL to put you on the "Evacuation Assistance List"

E. If you smell smoke, close the door, pull the alarm, and evacuate the building. Call the UNCG Police or use a blue light phone when you get outside.

F. Fire Prevention
    a. No smoking, no candles, no incense, no halogen lamps
    b. No cooking equipment (microwave okay), extension cords with more than four devices
    c. Do not leave anything you are cooking. Do not leave the room when you are making popcorn or even boiling water, these actions often lead to fires.
    d. Keep the halls, walls, and stairs clear. No paper or plastic decorations in the hall.
    e. Report broken things to HRL staff 336.334.3498 or online at SchoolDude.com under residential services

G. Know two exit routes from your residence and anywhere you stay. In an emergency one might be blocked.
    a. Let's break into groups of 5 and take 1 minute to discuss the location of all the exits from your floor. Also list 4 reasons why knowing two reasons is important for you to know. Think about who else would be affected in an emergency if you did not at least two ways out. (limit to about 2 minutes)

H. When you leave UNCG Housing, make sure you stay somewhere with a fire alarm and fire sprinkler system. Most college student deaths occur in housing off campus. Ask for help finding these types of housing.

I. Let's review the most important things covered tonight.
    a. Always evacuate when the fire alarm sounds
    b. Know two ways out of the building
    c. Don't play with any fire safety equipment
    d. Don't leave the room if you are cooking.
    e. Can anyone add to this list? Raise your hand or shout it out (limit to about 1 minute)

J. Later tonight walk to the various exits and pay attention to how far they are from your room. Think about tow ways out of other places you stay and even classrooms.

K. Thank you for your attention, you will take a brief survey to help us make this experience better for future students.