Safe School Building Characteristics in Virginia's Elementary Schools: Architect and Principal Perspectives

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ABSTRACT

A safe school is defined as a physically and emotionally safe environment where faculty and staff, members of the community, and students perceive that they are safe. School safety is an important topic for both school administrators and architects who design schools. Previous research into the physical environment of a school has explored its impact on student achievement and, to a lesser extent, school climate and school safety. Overall, research into the relationship between a physical environment of a school and its influence on the perception of safety is inadequate. The study sought to determine what were the design elements that principals and architects believed promoted a safe elementary school. The main research question for the study was, "What are the design elements that principals and architects believe influence a safe elementary school?"

The study replicated the methodology of Walton's study (2011) called *Physical Design for Safe Schools*. Walton focused on perceptions of high school principals and architects who were involved in designing and building schools. Walton's study concluded that safety was an important issue to principals and architects. Specifically, each group identified supervision, technology and cameras, and controlling access to school buildings as important to school safety. The groups also identified restrooms and locker rooms as the two most problematic areas of a school building due to inability to supervise.

Data for the study were gathered through qualitative methods and utilized a phenomenological approach to exploring data. Principals from elementary schools built before 1999, principals from elementary schools built since 2011, and architects with experience designing elementary schools were included as participants in the study. Participants were asked five to nine semi-structured and open-ended questions relevant to the design elements and physical features associated with school buildings.

Results of the study found that the physical design of a school building was viewed as having an influence on safety in schools. The two common themes from all three groups were access control and visibility. Sub-themes were the importance of preparation for emergencies,

perceptions of inequality in funding for school safety measures, the prevalence of technology that has created greater opportunities to keep schools safe, and the need for balance between safety and aesthetics when designing schools.

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GENERAL AUDIENCE ABSTRACT

"A safe school is defined as a physically and emotionally safe environment where faculty and staff, members of the community, and students perceive that they are safe. The study sought to determine what were the design elements that principals and architects believed promoted a safe elementary school. The main research question for the study was, "What are the design elements that principals and architects believe influence a safe elementary school?" The study concluded that safety was an important issue to principals and architects. Results of the study found that the physical design of a school building was viewed as having an influence on safety in schools. The two common themes discussed were access control and visibility. Sub-themes were the importance of preparation for emergencies, perceptions of inequality in funding for school safety measures, the prevalence of technology that has created greater opportunities to keep schools safe, and the need for balance between safety and aesthetics when designing schools."

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CHAPTER 1
INTRODUCTION

Introduction

A safe school involves numerous dynamics that influence all who utilize a school building. Each variable plays an important role in influencing actual and perceived safe environments from stakeholders in a school community. The literature on school safety is extensive. The literature changes as different avenues of school safety have been investigated. Major events have an impact on policy makers and school districts as they seek to create policies designed to keep students physically and emotionally safe.

Fowler (2013) identifies "trigger events" as events that "clarify or dramatize" an issue in such a way that they bring a sense of urgency to the issue in the minds of the public and policy makers (pg. 165). On April 20, 1999, twelve students and one teacher were killed by two students from the school (Library, n.d.). The tragedy in Littleton, Colorado became a milestone event in the study of public school safety as schools began to increase visible security measures like security cameras and security guards (Addington, 2009). Prior to the shootings at Columbine, issues in school safety were limited to topics such as fighting, sexual harassment, bullying, and classroom management (Heinen, Webb-Dempsey, Moore, McClellan, & Friebal, 2006). Columbine, however, became associated with an expanding national dialogue about fear and terrorism in the United States (Altheide, 2009). In the two years after Columbine, issues like school discipline were elevated to issues of national urgency (Skiba, 2000). Schools became sophisticated tools for surveillance and focused on tougher disciplinary measures in an attempt to prevent future mass casualty situations in America's public schools (Lewis, 2003). In fact, the shootings at Columbine were the most important event in shaping the cultural narrative about school, youth, and popular culture in a generation (Altheide, 2009). Consequently, policy makers and the public were forced to realize that school violence was no longer just an issue for urban, inner-city schools.

Issues of school safety continue to drive public policy. Due to parents' demands for tangible steps from local school administrators, an outcome of the Columbine tragedy was that policy makers expected schools to focus on the following as part of comprehensive school discipline and safety policies: conflict resolution, social instruction, classroom strategies for

dealing with disruptive behavior, parental involvement, early warning signs and screening, school and district-wide data systems, crisis and security planning, school-wide discipline and behavior planning, functional behavioral assessments, and individual behavior plans (Skiba, 2000). Parents demanded tangible steps from local school administrators. A day after the Columbine shooting, parental apprehension was the highest on record as 55% of parents indicated that they were fearful for their children to go to school (Altheide, 2009). In response, visible security measures were implemented in school buildings. Metal detectors and security cameras were placed in many schools in addition to trained personnel like school resource officers (Addington, 2009). All of these steps were taken so that parents could see schools were being proactive rather than reacting to another calamity.

Another trigger event in the development of policy on school safety was the shooting at Sandy Hook Elementary on December 14, 2012 where 20 children and 6 adult staff members were killed ("Sandy Hook Elementary Shooting," n.d.). An outcome was even greater public discussion about gun control and other measures as steps to prevent violence in schools and in society (Chrusciel, Wolfe, Hansen, Rojek, & Kaminski, 2015; Schildkraut & Muschert, 2014). Other measures, like arming school employees, became policy proposals in state legislatures throughout the country (Schildkraut & Muschert, 2014). The events at Sandy Hook continued the promotion of increased security measures born from the events at Columbine, but caused further concern since Sandy Hook seemingly had advanced security measures already in place (Addington, 2009). In response to the shootings at Sandy Hook, President Obama proposed a comprehensive school safety plan in January 2013 (Klein, 2013). Klein (2013) explained the President's proposals to Congress: new federal programs aimed at assisting school districts' emergency preparedness, helping schools hire safety personnel, more social workers and psychologists in schools, and training teachers to better identify students with mental illnesses. Furthermore, President Obama sought a ban on military style assault weapons, restrictions on the capacity of magazines, and requirements of expanded background checks for all gun sales. Despite all the proposals related to school safety, neither Columbine nor Sandy Hook resulted in the passing of major legislation (Schildkraut & Hernandez, 2014).

The events at Columbine and Sandy Hook precipitated and influenced the Virginia General Assembly as it amended the legal code to address concerns over school safety. On March 20, 2013, House Bill 2346, which created a comprehensive school safety plan for schools,

was passed with the following requirements for school divisions: designate a division wide emergency manager; appoint a division wide safety audit committee; establish threat assessment teams; update the school crisis emergency management and medical emergency response plans; conduct school safety building inspection walk-throughs; complete a school safety audit survey; complete the Virginia secondary school climate survey for students and teachers; complete the division level safety audit survey; and conduct school safety audits on incidents that have been reported to school authorities (Ransone, Cosgrove, Greason, Scott, & Torian, 2013).

The legal code of Virginia, as part of school safety audits, now requires use of a standardized checklist to comprehensively examine the physical environment of schools seeking potential vulnerabilities that would lead to an unsafe environment (§ 22.1-279.8.). The code, furthermore, states that the checklist should "incorporate crime prevention through environmental design principles" (§ 22.1-279.8.). McClester (2011) describes crime prevention through environmental design (CPTED) as limiting opportunities for criminal and/or violent behavior. Opportunities are limited through entry control strategies like limiting entrances from outside the school and by designing doors that lock from the inside; by using video surveillance and intercoms; by eliminating "dead space" where individuals can congregate; by having clear sightlines that allow for natural surveillance throughout the school; and by securing valuable assets throughout the school (p. 76). There are some studies analyzing the impact of CPTED principles on preventing actual crime in neighborhoods and schools, but peer reviewed literature exploring the influence of CPTED on schools is limited (Montoya, Junger, & Ongena, 2016; Schneider, 2000).

Research Questions

The main question that will guide research for this study is:

What are the design elements that principals and architects believe influence a safe elementary school?

Two sub-questions will also guide research for this study:

1. What design elements would an architect think influence school safety?
2. What design elements would an elementary school principal think influence school safety?

Significance of the Study and Practical Implications

An intended outcome of the study is to identify what physical characteristics of old and new elementary school facilities are perceived by elementary school principals and architects as most significant in keeping schools safe. Research has been conducted on the physical layout of a school and how it impacts students. Recent studies on school facilities have included topics such as building quality and student achievement (Bowers & Urick, 2011; Gibson, 2012; Harrison, 2010), building conditions and instructional practices of teachers and student behaviors (Duyar, 2010; Wheeler, 2014), attitudes and achievement during the renovation projects (Mayo, 2012; Norman, 2014; Thompson, 2014). Since school divisions and building administrators are responsible for adhering to the law in Virginia as it pertains to school safety, further exploration of the principles of CPTED and principal perceptions of its effectiveness is necessary. Principals are acutely aware of the degree of safety in their school buildings and the potential influence that perceptions of safety has on the users of the school building. The findings of the study will serve as important data on safety measures and the needs of schools. School divisions can take conclusions from the study and gather ideas for possible implementation.

All public schools in Virginia are also guided in their efforts to provide safe schools for students by the Virginia Center for School and Campus Safety (VCSCS). According to their website, http://www.dcjs.virginia.gov/vcscs/, the VCSCS is a part of law enforcement division of the Virginia Department of Criminal Justice Services and serves as a resource and training center for state and nationwide school safety efforts. It was created through the Virginia legal code §9.1-184 (Code of Virginia, n.d.).

The purpose of VCSCS is to maintain schools focused on academic excellence free from fear of crime and violence. The VCSCS can take findings from the study and evaluate the effectiveness of CPTED as it is applied to school buildings throughout the Commonwealth.

After ascertaining principal and architect perceptions, the study will provide insight as to which aspects of a school building's design are most important in keeping students safe. School boards, superintendents, and architects will have further insight into how to design schools so that stakeholders can feel safer. This study will assist those who manage and design schools as they seek to create policies and design new buildings that are safer. The study will also assist those involved with renovating older school buildings as they seek design features that will address modern-day safety needs. The study will assist educational and architectural researchers

since they can use the findings to conduct further research into the physical design of a building and how it influences safety. The study will, most importantly, benefit students who will learn in schools that have been designed and renovated with safety in mind.

Description of Terms

The following terms will be used throughout the study. A definition of each term has been provided for clarity.

1. *Safe school* is defined as physical and emotionally safe environments where faculty and staff, members of the community, and students perceive that they are safe. Safe schools are identified by three characteristics: physical and safety features that are visible, located in or around schools, and increase physical safety; organization and school discipline that promotes an orderly environment; and positive relationships among all key stakeholders that increases feelings of safety within a caring community (Bosworth, Ford, & Hernandez, 2011).
2. *Crime prevention through environmental design* (CPTED) is defined as "a carefully designed physical environment can deter crime by limiting the opportunities for and vulnerabilities to negative influences" (McLester, 2011, p. 72).
3. *School facilities* are defined as buildings and grounds, parking lots, playing fields, and equipment used for educational purposes (Walton, 2011).
4. *New school building* is defined as a school facility constructed since 2011.
5. *Old school building* is defined as a school facility constructed prior to 1999.
6. *School design elements* are defined as, "structural elements that can be separately added to or deleted from the design of a school building" (Walton, 2011, p. 5).

Delimitations of the Study

1. The study is restricted to public elementary school facilities in the Commonwealth of Virginia.
2. The study is restricted to the views of five elementary principals from public schools in Virginia who work in buildings that were built within the past five years and to five elementary principals from public schools in Virginia who work in buildings that were built prior to 1999. The reason why 1999 will be chosen is because 1999 is the

year that the shootings at Columbine High School occurred. This event is a pivotal event in shaping present-day understandings of safe schools that data from users of buildings designed before then may provide a contrast with data from users in new school buildings.

3. The study is restricted to architects who have been involved in designing of public elementary schools in the Commonwealth of Virginia.
4. Due to a plethora of federal, state, and local regulations involving school building design, specific regulations in the Commonwealth of Virginia will not be discussed as part of the literature review. Specific regulations will only be reported as initiated by participants.

Limitations of the Study

Data drawn from the study will be limited in generalizability because it will only reflect the beliefs and ideology of principals who will be from schools built within the past 5 years or from school built prior to 1999. Therefore, the findings of this study may not be useful to all school buildings. The views expressed by the architects who are the focus of the study will be limited by individual design experiences and individual beliefs about school buildings. Architects selected have experience designing elementary school, so perspectives on which aspects of school buildings influence safety will be limited to elementary school design elements and, not necessarily, middle and high school design elements.

Organization of the Study

Chapter 1 of the study will contain an introduction to school safety and what the study will be about, research questions that will drive the study, a statement of the significance of the study, practical implications for the study, a description of key terms that will be used throughout the study, delimitations that will limit the study, and limitations of the study.

Chapter 2 will contain a basis for the study. It will include an overview of relevant research conducted to explore the physical environment of buildings and how it impacts student achievement, school climate, and, safety. Most of the research relates to student achievement but studies are beginning to investigate how the physical environment impacts climate and safety.

Chapter 3 will contain an overview of the population that will be used in the study, what type of research design will be used, what data is needed to conduct the study and how it will be gathered, what instrumentation will be used to obtain data, how the data will be managed, and how the data will be analyzed.

Chapter 4 will contain a summary of the findings after conducting the study.

Chapter 5 will contain conclusions from the study, a discussion of the findings, implications for practice, and recommendations for further research.

CHAPTER 2
REVIEW OF RELATED LITERATURE

Introduction

School safety is a broad field of study that provided a great deal of information regarding a variety of topics within the field. Research has analyzed public school safety measures by comparing them across geographic settings (Shelton, Owens, & Strong, 2009) and by examining relationship between school safety measures and the level of peer victimization (Blosnich, 2011). Other studies sought to improve school climate for teachers, parents, and community members by exploring teacher and student perceptions of safety (Booren & Handy, 2009; Booren, Handy, & Power, 2011; Bosworth, 2010; Hernandez, Floden, Bosworth, Ford, & Hernandez, 2011; Ricketts, 2007\). More recently, studies examined how the presence of law enforcement in schools affected students' feelings of safety at school (Theriot & Orme, 2014), and principal and law enforcement perspectives on school resource officers and arming of school employees (Chrusciel, Wolfe, Hansen, Rojek, & Kaminski, 2015). The past three decades of research have recognized the importance of school climate in schools since there is a growing interest in locating data-driven school improvement strategies that promote safer and more supportive school environments (Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013).

Determining the perception of stakeholders as it related to school safety was a commonly used method of data collection (Booren, Handy, & Power, 2011; Bosworth, Ford, & Hernandez, 2011; Hernandez, Floden, & Bosworth, 2010; Maxwell, 2000; Maxwell, 2016; Maxwell & Schechtman, 2012; Niven, Henretty, & Fawkner, 2014;Tanner & Langford, 2003;). Students who perceived schools as unsafe often drew these conclusions because of personal experiences of peer victimization (Astor, Benbenishty Zeira, & Vinokur, 2002; Goldstein, Young, & Boyd 2008). Goldstein et al. (2008) reported that students' academic performance was diminished when the school environment was seen as dangerous. Similarly, Reijntjes, Kamphuis, Prinzie, and Telch (2010) found that feelings of lack of safety led to lower levels of personal confidence and lowered rates of academic achievement.

Cash (1993) stated, "If students perceive education as something to be done in a poor quality facility, they also perceive it to be of less value…to encourage academic excellence and potential economic success, schools must represent a better way of life-a promise of the future.

Schools should reflect the environment of success" (p. 83). This chapter focuses, specifically, on how the physical environment impacts student achievement, school climate, and, school safety. While the present study will focus on the insights of building administrators and perceptions of safety within schools, research analyzing the relationship between a school's physical environment and perceived or actual safety was limited. Therefore, this chapter contains an overview of studies that have analyzed the physical environment of a school and its impact on student achievement and, to a lesser extent, school climate, and safety. Ultimately, the chapter informs and focuses the topic of the physical environment as it related to school safety. It also demonstrates that a need exists to understand the influence of a school's physical environment on safety in schools.

Facilities and Student Achievement

Earthman and Lemasters (1996) conducted a synthesis of studies that were related to building condition and student achievement and student behavior. They concluded, "the preponderance of research cited shows very close relationships between the built environment and how well students and teachers perform in that environment" (p. 11). Like Cash (1993) and Hines (1996), Earthman and Lemasters found that test scores of students in standard buildings increased above the scores of students in substandard buildings. Similarly, Earthman (1998) solidified Earthman and Lemasters' synthesis and presented a summary of studies exploring educational facilities and student achievement. Earthman's study concluded that there was a strong relationship between both variables. Specifically, Earthman established five major conclusions:

1. School buildings account for as much as 5 to 17 percent of the variance in student achievement scores.
2. There may be a cumulative effective upon students when looking at the disparity in student achievement scores in above and below standard buildings.
3. Equity of student access to a quality education becomes a major concern when some students are educated in poor quality buildings compared to those who are educated in above standard buildings.
4. There is an economic value associated with improved school buildings if school buildings do, in fact, increase student achievement.

5. The condition of a building is something that can be improved by school authorities.

Most studies reviewed have concluded that facilities do, indeed, have an impact on the academic environment. The Commonwealth of Virginia, for example, has been the subject of a number of studies related to building condition and student achievement. Cash (1993) studied small rural high schools in the commonwealth of Virginia where students were of limited socioeconomic conditions. Cash used the Commonwealth Assessment of Physical Environment (CAPE) survey instrument, which was composed of 27 items. Schools with a resulting scores in the bottom quartile were classified as substandard and schools with a score in the middle two quartiles were identified as standard. The study found student achievement was higher in buildings with better quality ratings and that student achievement had higher averages on state standardized tests in schools with higher cosmetic ratings. The remaining schools were classified as above standard.

Similarly, Hines (1996) used the CAPE instrument and concluded that scaled scores improved on every subtest on the Test of Academic Proficiency when buildings were above standard conditions compared to buildings that were rated substandard. Newer buildings were associated with higher achievement scores. Crook (2006) and Thorton (2006) both conducted studies at high schools in Virginia that looked at the relationship between percentage of students passing the Virginia Standards of Learning (SOL) exams and the condition of school buildings, as measured by the CAPE survey. The study discovered that student achievement was higher in English and science for buildings that were rated as higher quality, while relationships among Algebra II and Geometry scores and building condition were not statistically significant. Thorton furthered Crook's study by using the same population but focused on student subgroups like low SES and students who were minorities. The results, however, appeared to contrast what is commonly understood in the literature about minorities and standardized testing achievement. The study found that minorities who were educated in standard and substandard buildings, taught using the same objectives by certified teachers, and who were administered a criterion referenced test could attribute differences in scores to the condition of the building. Conversely, there was no apparent influence of the building condition on students who were economically disadvantaged.

Renovation projects have been the focus of other studies involving facilities and student achievement. While there were few studies available to review these variables, the ones

reviewed provided some insights into the impact of renovation and how school administration can manage capital improvement projects. Maxwell (1999) expressed concern that the process of upgrading building facilities became a significant disruption to student learning. More recently, Mayo (2010) addressed this concern by exploring the influence of renovation on middle school student achievement in Virginia as it related to math and reading scores. When controlling for the percentage of students who were minorities, who were low income, and for the quality of staff in each of the ten schools reviewed, he found that achievement did not significantly differ over the course of the renovation projects. Norman (2014) replicated Mayo's study but focused on elementary schools. In the 15 buildings that completed a renovation project, no difference was found in the mean scores of students statewide compared to the population of the study. Thompson (2014) replicated Mayo's study but focused on 11th grade student scores in Algebra I and in reading. Again, no difference was found when comparing statewide mean scores and the population of the study. While renovation certainly impacted the users of school facilities, overall, renovation studies showed that it is possible to experience the renovation process while limiting the impact on student achievement.

Martorell, Stange, and McFarlin (2016) conducted a study with a different focus than the previous studies on renovation. This study did not focus on the process of renovating, rather on outcomes on learning after the projects were completed. Over 1300 school capital improvement projects funded through bonds in Texas were included in the study, which analyzed whether the improvements had any impact on student achievement. Martorell et al. found that after the projects were complete, there were few, if any, effects on operating expenditures or on average class size. Ultimately, the study concluded that there was no significant evidence of school capital improvements increasing student achievement because little of the income was actually spent on students. The study recommended that money borrowed for capital improvement be used to reduce class sizes and on other operating costs that directly impact students, instead.

The architectural design of a school building has also been examined in studies as a variable in relation to student achievement. Clearly defined pathways that allowed for freedom of movement within schools and among learning environments was the most significant design pattern that correlated with high student achievement in several studies (Gentzel, 2016; Tanner, 2000, 2009; Yarbrough 2001). Large group meeting areas, color scheme, availability of outside learning areas, and instructional laboratories all have been significantly correlated with student

achievement (Darmondy and Smyth, 2012;Yarborough, 2001;). Conversely, poorly designed and maintained outdoor spaces correlated with lower ITBS scores (Tanner, 2000). Even landscaping has been considered as an independent variable. For example, Wu, McNeely, Cedeño-Laurent, Pan, Adamkiewicz, Dominici, Lung, Su, and Spengler (2014) found that when a high amount of trees and vegetation are present within the vicinity of a school, student achievement was higher than for students in schools with limited surrounding vegetation and trees.

Structural or cosmetic features on the interior or exterior of a school building could influence the achievement of students. Variables like more windows, carpeting in classrooms, and the presence of air conditioning have been related to higher scores (Hines, 1996; Tanner & Langford, 2003). Actions designed to improve the appearance of a building like sweeping and mopping floors regularly, cleaning graffiti off exterior and classroom walls, and an indoor painting cycle found similar results (Hines, 1996; O'Sullivan, 2006). Classrooms with florescent lighting were associated with high pass rates in English writing and reading exams (Crook, 2006). Rooms without direct access to natural light were viewed negatively by users of the school building and actually were perceived to cause health issues among teachers (Darmondy & Smyth, 2012). Heschong (2002) found that the presence of daylighting is a reliable predictor of improved test scores across diverse school environments. According to some studies, the type of lighting and presence of natural light has not conclusively demonstrated a positive relationship to student scores but enough evidence is present to warrant further analysis (Crook, 2006; Gentzel, 2016; Tanner, 2009). The temperature of a school and classroom has been positively associated with student achievement (Earthman & Lemasters, 1996; Hines, 1996). Poor ambient temperature was also seen as a reason for classrooms being the least favorite part of a school building due to the impact on pupil comfort (Darmondy and Smyth, 2012; Maxwell & Schechtman, 2012). The aesthetic qualities of a school's physical environment like visible water stains or spots on the ceiling, poor acoustical properties, and the presence of graffiti were identified by students as being negative, rather than positive features of the building they inhabit (Cash, 1993; Maxwell & Schechtman, 2012).

Over time, technology was included as a part of the school's physical environment to influence student achievement. Student achievement scores were better if technology like laptop connections, projection screens, laboratory equipment, student microphones, and software-based

simulations were available to teachers and students (Tanner, 2000; Brooks, 2011). Even neighboring facilities, like swimming pools, adjacent to the building are associated with better overall student achievement (O'Sullivan, 2006). At minimum, these features warrant further consideration in order to determine to what degree they impact students.

Embedded in the literature were studies that used qualitative methodology to collect data in order to ascertain the perceptions of stakeholders on the building condition and its perceived impact experiences using the building. Perspectives of principals, teachers, students, and architects have all been sought in order to understand how they perceived a school's physical environment to impact academics. In these studies, few researchers sought to compare perceptions to actual achievement data. However, one study compared perceptions to empirical data on student achievement. In Crook's (2006) study, for example, schools where principals rated the quality of the building as being standard or substandard, a significant difference was found between the percentage of students passing standardized assessments in standard and substandard buildings. Other studies examining the outlook of school administrators focused on how they perceived the condition of a building to impact their instructional leadership. Simon, Evans, and Maxwell (2007) synthesized studies that interviewed principals from international schools and found that the majority felt their ability to provide instructional leadership was not deterred by the quality of buildings. Similarly, Harrison (2010) explored Title I schools in Virginia that were identified for school improvement. Specifically, the study looked at how the condition of the facilities impacted student achievement, according to the standpoint of administrators. Harrison found that maintaining acceptable building conditions was seen less frequently as a very important factor in raising student achievement. However, principals did report poor quality building conditions did impact their ability to retain effective teachers. While the overall conclusion to the study was that principals did not perceive building condition to be an important factor in improving schools, research on the importance of building condition and student achievement was cited while suggesting principals should consider this variable when planning for school improvement. Overall, it appeared that the perception of instructional leaders was that building quality had more of an indirect impact on users of a school than direct.

Stakeholder perspectives on school building design was sought on the belief that building condition affected everyone who utilized the facilities. School planners, architects, teachers, superintendents, and administrators all have different perspectives on how schools should be

designed. McMichael (2004) determined that planners and architects viewed involving all stakeholders in the design process as more important than the other groups. Planners, architects, and superintendents viewed providing health, safety, and security as less important than the other groups. Teachers, on the other hand, viewed utilizing all available resources as most important compared to planners, architects, and superintendents. Superintendents and planners viewed having public gathering areas as less important than teachers, architects, and administrators. McMichael's study, ultimately, demonstrated the difficulty in balancing the desires of all stakeholders while arguing for the importance of considering them.

In other studies, principal, teacher, and student perceptions were recorded. Principals reported more frequently than teachers that the interior design of a school was an important variable student learning (Tanner & Langford, 2003). Bishop (2009) studied three new high schools in Virginia and concluded that principals and teachers did not believe building condition had any impact on student achievement than older buildings. Conversely, Asiyai (2014) studied students' perspectives on the physical learning environment. Students indicated that the condition of schools and classrooms did, in fact, impact levels of motivation, perceptions on whether or not teachers were willing to help, willingness to go to school, and personal behavior.

Conclusions drawn from the research differ as to how and to what degree an impact is made and whether the influences are direct or indirect. On the whole though, researchers have generally concluded that facilities have a significant impact. Earthman and Lemasters (1996) summarized the conclusions when they stated, "spending funds to improve the built environment will produce greater results than funds spent on materials, textbooks, and even teachers" (p. 12). Brooks (2011) stated, "physical space alone can improve student learning even beyond students' abilities as measured by standardized test scores" (p. 725). Literature showed the physical condition of a building greatly matters when it comes to students' academic success in the classroom. At best, other variables are impacted, which impacts student achievement.

Facilities and School Climate

Variables other than student academic achievement have been considered as dependent factors in relation to the primary variable of physical environment. Citing the difficulty of establishing a direct impact of facilities on student achievement the studies reviewed attempted to analyze school climate as a potential bridge to effects on student achievement. Maxwell

(2016) argued for the importance of understanding user perceptions on climate by stating, "The path from school building condition to academic achievement is mediated by student perception of the school's social climate" (p. 212). School climate was described as, "…patterns of people's experiences in school life and reflects normal, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures" (Thapa, Cohen, Guffey, Higgins-D'Alessandro, 2013, p. 2). While school climate was a field that contains a large amount of research, investigating the impact of facilities on climate was a relatively recent and limited field of research.

Studies showed that attitudes of those who used school facilities was greatly affected by the physical condition of a building. Bowers and Urick (2011) sought to analyze the impact of school facilities on student achievement by conducting a nationwide study of high school students. This study concluded that there was, most likely, no impact of building condition on math achievement beyond the presence of basic necessities like heating, lighting, and roofing. The study did find, however, that the physical environment may impact variables like reading achievement, graduation rates, the number of students pursuing post-secondary education, school discipline, participation in extracurricular activities, and enjoyment of schools. Inadequate facilities led to a belief that there was not a clear focus on academics, the learning environment was seen as less serious, and the community was not as engaged in support of teaching and learning (Uline & Tuschannen-Moran, 2008). The study was similar to Earthman and Lemaster's (1996) study that found an association between parental involvement and condition of a building.

Evidence of physical disorder like broken windows, trash, graffiti were found to create an environment of social disorder, which impacted students' ability to learn and find success in schools (Bradshaw, Waasdorp, Debnam, & Lindstrom, 2014). Maxwell (2016) concluded, "School buildings that are in good condition and attractive, may signal to students that someone cares and a more positive social climate which in turn may encourage better attendance" (p. 212). While the link between facility condition and student achievement has been established by the literature, climate is a field that bridges a gap between the two, helping educators better understand how the two variables were related.

The impact of a school's physical environment on school climate may also have an impact on the attitudes of students and staff, which affects motivation, job performance, and

physical well-being. An association between faculty and student attitudes and building condition was found by Morris (2003). The study found that teacher satisfaction improved when the quality of the physical learning environment improved. Morris even concluded that motivation, student illness, and teacher sick days correlated significantly with building quality, specifically temperature, cleanliness, ventilation, and noise levels. When including faculty attitudes in conjunction with student behavior, Peterson (2014) concluded that building condition was a significant factor at the elementary level, but not at the high school level. Peterson also found that the condition of a school building influenced the attitudes of staff and students towards their work and their attitudes towards maintaining the well-being of the school itself more so than the academic achievement of students. In summarizing research on facilities and health, Gentzel (2016) stated, "research has linked schools' physical environment to student and staff health and behavior. Certain design elements and environmental factors can affect everything from students' vision and concentration to the number of days a teacher calls in sick" (p. 4). Martorell, Stange, and McFarlin (2016) also concluded that improved facility condition could lead to better student health.

The size of a school building is another feature of the physical environment that has been explored in relation to school climate. While the research did not settle on what was the optimal size for learning, there was a difference in the impacts of size on elementary and high schools (Stevenson, 2006). Some studies sought to find an optimal school size for elementary and high schools. Lee and Smith (1997) found a positive relationship between high school size and student learning but speculated that the impacts are more direct. The basic features of academic organization like curriculum and social organization, collegial interactions among staff members, and personalized interactions between staff and students, both impacted by the size of a building, were seen as most likely to impact student learning. Similarly, Leithwood and Jantzi (2009) stated that the best size for elementary and secondary schools was 500 and 1000 students, respectively, while 300 and 600 were best for elementary and secondary schools with a higher percentage of disadvantaged students. The reasoning behind the conclusion was that a small school size creates a positive relational climate, which influenced student achievement. The importance of personal interactions between all members of the school and the community have been used as arguments in favor of small schools (Darmondy & Smyth, 2012).

Luyten, Hendriks, and Scheerans (2014) synthesized studies on school size and concluded that size mattered to student performance more than non-cognitive outcomes like social cohesion, safety, well-being, and community involvement mattered. The study also concluded that size mattered more in rural settings than in urban settings since rural schools were often the "center of social activity" (p. 17). They found that school size mattered more for disadvantaged students and for elementary students. The most significant finding was the "striking difference" between American and International schools (p. 37). American schools that were classified as smaller tended towards higher rates of student achievement while studies in other countries found that larger school performed better. Even though many studies claimed that small schools are better for climate, the issue has not been fully resolved by the literature (Stevenson, 2006). However, there was enough evidence to suggest school size mattered in relation to how it impacted climate within a school.

An important component of school climate involved the behavior of students, which impacted the learning environment. Research, however, has not provided definitive answers when exploring the relationship between facility condition and student behavior. Cash (1993) found a negative relationship between the behavior of students and building condition but was unable to clarify how buildings impact behavior. While the study did not emphatically state that student behavior was impacted by building condition, it did find enough evidence to recommend further exploration. Hines (1996) used the ratio of student expulsions, suspensions, violence, and substance abuse as a measure of student behavior and found that suspensions increased as the building conditions went from substandard to standard based on CAPE rating. Similarly, Hines found that expulsion and reports of violence and substance abuse increased as building quality increased. The study concluded that better building ratings led to greater diligence in demanding acceptable behavior from educators. Principals and teachers, in Bishop's (2009) study, perceived that student behaviors improved when in newer buildings as compared to older ones.

Maxwell and Schechtman (2012) found that the quality of a school building, whether perceived by users or observed by an objective instrument, was important for developing the self-efficacy of students, particularly young adolescents. The study concluded that actual and perceived school building quality was related to student academic performance. It also found that perceptions of non-instructional areas like the hallways, the cafeteria, and the library were

better predictors of academic success than perceptions of classroom condition. Teachers, on the other hand, indicated classrooms were most significant to student success if they were, "peaceful, quiet, safe, clean, and comfortable" (p. 41). Students perceived that the cafeteria was a favorite location in school as long as it was not crowded and noisy. The gymnasium was least favored because it was hot and cramped. Maxwell's (2016) study examined the importance of school climate by assessing ratings of building condition as a predictor of school social climate. Results showed that higher ratings of school climate predicted lower student absenteeism. In fact, student attendance accounted for 48% of the variance in student achievement.

Asiyai's (2014) findings were similar to Maxwell and Schechtman (2012) and Maxwell (2016) in that students self-reported building conditions as a factor in keeping them from attending school. Also similar, Darmondy and Smyth (2012) found that classrooms with no open windows led to teacher concerns about noise in a classroom and the impact on teaching and learning due to a distracting impact on students. Finally, Maxwell's conclusions on school gymnasiums were similar to Niven, Henretty, and Fawkner (2014), who found that adolescent girls' perception of physical education was greatly impacted by the changing facilities and the quality of equipment. Overall, the physical condition of a building and the relationship to school climate has been recognized as an important variable in understanding how building condition impact student achievement.

Facilities and School Safety

The final component of the literature reviewed involved the physical condition of a school building and its impact on actual and perceived safety. Along with school climate, research analyzing the relationship between the building design and safety was been limited in scope (Marzbali, Abdullah, Razak, & Maghsoodi, 2012; Walton, 2011). However, more recent studies began to explore the relationship in greater depth. Building security was a prominent avenue investigated when exploring how student and teacher performance were related to the condition of a building. Accordingly, research has concluded that school leaders should consider the safety and security of students when designing and constructing a school (Peterson, 2014). The security of a building impacted how students view themselves and was related to feelings of academic competence, self-efficacy, and behavior (Maxwell & Schechtman, 2012).

Maxwell (2000) sought to understand what features of a physical environment contributed to a safe and welcoming school and sought to understand the difference between students, teachers, and parents' perceptions. The following characteristics of a school were identified as important in making a building seem safe and welcoming:

- Student work displayed throughout the building (79%).
- The building was maintained in a clean manner (68%).
- A clearly defined visitor policy was in place (51%).
- Bulletin boards displayed key information (44%).
- The location of the main office (33%).

Maxwell's study summarized the importance of the physical environment to school safety since it played a role in, "…creating an atmosphere conducive to learning and teaching. Surely if students and teachers do not feel comfortable and safe, learning and teaching will suffer. Since schools are work places for teachers and the staff, the environment should meet the needs of the workers and encourage productivity" (p. 280).

Klein and Cornell (2010) sought to understand the relationship between school size and student victimization, also known as bullying, among ninth grade students in Virginia's public schools. They found no significant relationship between reports of being a victim of bullying and the enrollment size of a school. Neither was a relationship found between student self-reported rates of being threatened and physically attacked at school and school size. The conclusion of the study was that larger schools are perceived to have more bullying and victimization, but only because incidents occur more frequently in larger schools and not at a higher rate than smaller schools. Bosworth, Ford, and Hernandez (2011) concluded that staff and students both value physical characteristics of a school like size and proximity to danger as important factors in determining school climate and safety. Syrjäläinen, Jukarainen, Värri, and Kaupinmäki (2015) explored how young students perceived safety at school and what made them feel insecure. The study cited the importance of relationships with adults in helping students feel safe. It also underscored how important the physical environment was since it was listed as one of the top three most important factors in making students feel safe. Specifically, students expressed anxiety over confined facilities which led to shoving in corridors, doorways, and stairways. Some expressed concern over the architectural design of a building. For example, a student indicated fear of being thrown from a rail of a third floor in their school and others

stated they may be spit upon from the same rule. Ultimately, the design of a building, according to Syrjäläinen et al., encouraged or discouraged supervision and security, which impacted students' association with safety through familiarity, ordinariness, and homogeneity. In keeping with the assumption that the physical environment impacted users of a building, researchers studied CPTED principles that were present in neighborhoods around schools and in school buildings. The presence of territoriality was a component of CPTED that was manifested when there were large open spaces between closed spaces like classrooms, large parking lots, and gates used at various access points. The result of territorial control was that school administrators, teachers, and students were found to interact and share information collaboratively when territoriality was established in surrounding neighborhoods (Fram, 2010). When neighborhoods worked with local law enforcement to implement CPTED principles, students perceived schools as being safer (Kitsantas, Ware, & Martinez-Arias, 2004). Conversely when broken windows and other signs of physical disorder were present in schools, the implicit message was that users of buildings did not care. Therefore, criminal activity and other antisocial behaviors were more likely to occur (Plank, Bradshaw, & Young, 2009). While some studies reviewed demonstrated the importance of the physical environment in keeping schools safe, few directly analyzed impacts on schools in a way that was generalizable to larger populations. There was some evidence, though, suggesting an environment designed for safety may lead to greater feelings of safety among its inhabitants (Marzbali et al., 2012).

Walton (2011)'s study examined perspectives of high school principals and architects who designed schools on what aspects of the physical design of a building influenced school safety. The purpose was to identify design elements that were perceived to help or inhibit safety among users of a school building. After interviewing a group of high school principals whose school was built prior to the tragedy at Columbine, a group of principals whose school was built in the previous five years, and five architects who were involved in designing and building schools, the study concluded that safety was an important issue to both high school principals and architects who designed schools. Specifically, each group valued the ability to see and to supervise students in large groups, technology and cameras, and controlling access to school buildings through the flow of traffic or through the number of doors available for use. Furthermore, architects believed that schools were safer in 2011 than they were prior to Columbine, largely due to the lessons learned from the incident. The two most problematic areas of the school

according to all three groups were restrooms and locker rooms due to visibility concerns. All expressed concern that they were unable to secure the large numbers of doors and windows. Walton concluded that principals should be involved in the design phase of constructing schools due to their understanding of the physical design of a school building and how schools are organized.

After reviewing the literature, what has been firmly established is that a school's physical environment impacts the users. Consequently, the school improvement process must involve improving of facilities (Hines, 1996). The value a school or a school division places on the quality of education is clearly communicated by the way the building is designed and maintained (Uline, 2008). Adequate facilities are most likely necessary for high levels of student achievement (Bowers & Urick, 2011). In fact, in addition to qualified teachers, good teaching materials, and a well-defined curriculum, a fourth aspect of a quality education is the physical environment (Knapp, Noschis, & Pasalar, 2007).

The need for further research into the physical condition of a building and the impact on the safety and security of its users continues to be an area in need of further exploration. The same could be said for studies analyzing the relationship between the design of the school and school climate. Schools are microcosms with many interrelated factors. These factors impact school climate, which includes student outcomes like feelings of safety (Maxwell, 2016). Therefore, more research is needed to understand how these dynamics play out within a building. School architecture is also a "neglected aspect of educational research" (Tanner, 2000, p. 309). Effective architectural design will ensure that poor planning, design, and construction do not drive schools into poor performance (Tanner, 2000). Overall, more research is needed in order to understand how the physical environment of a school is related to school safety, which will drive how schools are designed, built, and maintained.

CHAPTER 3
METHODOLOGY

Introduction

This chapter contains an overview of the methodology used to conduct the study. The purpose of the study was to identify what design elements of old and new elementary school facilities were perceived by elementary school principals and architects as most important in keeping schools safe. To answer the research questions, the study was a replication of Walton's study called "Physical Design for Safe Schools" (2011). This chapter describes the methodology that was used to obtain and analyze data for the study. The chapter contains the following sections: restatement of the research questions that guided the study, the population that was studied, methods that were used to collect data, instrumentation that was used to collect data, and how the data were analyzed.

Research Questions

The main questions that guided research for this study was:

What are the design elements that principals and architects believe influence a safe elementary school?

Two sub-questions guided research for the study:

1. What design elements would an architect think influence school safety?
2. What design elements would an elementary school principal think influence school safety?

Population

The intent of the study was to identify what design characteristics of old and new elementary school facilities were perceived by elementary school principals and architects as most influential in keeping schools safe. Therefore, it was necessary to determine the perception of users of the buildings and architects who designed these buildings. Since principals are aware of how safety impacts users of the building and architects have a stake in fostering safe

environments, their input was required to consider which components were important to promoting safe schools.

Two groups of school principals were included in the population. One group of principals consisted of elementary school principals who were serving in old school buildings. The other group of principals consisted of elementary school principals who were administering new school buildings. Architects were selected based on experience designing elementary schools.

Sample

To locate individuals from both groups of principals, data were gathered from the Office of School Facilities Services (OSFS), which is a division of the Virginia Department of Education (VDOE). From these data, two lists were created. The first was a list of elementary schools constructed since 2011 and the architects who designed them. The second was a list of elementary schools constructed prior to 1999 and the architects who designed them. From each list, five schools were randomly selected. To randomly select schools, both lists of schools were inserted into separate Microsoft Excel workbooks. Then, a number was assigned randomly to each school using methods described by Davis (n.d.). Once a number was assigned to schools, the lists were sorted from the smallest to the largest number. The first five schools at the top of each list was schools from which principals were selected to participate in the study. Principals from those buildings became sources of data for the study.

To select architects for the study, the researcher listed architects from the ten schools chosen. Architects with the most experience designing elementary schools were sought as participants. From this list, only four architects were available. Other architects retired or were no longer employed by firms that designed the schools. Three of the four architects from the list participated in the study. The other two participants were located based on references from the three who participated. Architects interviewed each had experience designing elementary schools. A total of 15 interviews were conducted. Interviews included five principals whose buildings were constructed within the past five years, five principals of buildings that were constructed prior to 1999, and five architects with experience designing elementary schools.

Research Design

The study utilized a phenomenological perspective when analyzing data, qualitatively. The focus of data analysis was on learning the meaning of the participants' response rather than the researcher's interpretation of responses to address research questions that provided the focus of the study (Creswell, 2014). Phenomenological studies seek to accurately describe the meaning of the data since the goal is to remain true to facts as presented by the people involved (Groenewald, 2004). Lester (1999) stated that phenomenology looks at experiences from the perspective of the individual by seeking to understand, "taken-for-granted assumptions and usual ways of perceiving" (pg. 1). Creswell (2014) described the result of phenomenological studies as culminating, "in the essence of the experiences for several individuals who have all experienced the phenomenon" (p. 14).

Instrumentation

The interview questions used were validated as part of Walton's study (2011). The interview protocol was piloted with three administrators from the Walton's school division. A principal from an intermediate, middle, and elementary school were asked to pilot the questions with a focus on the clarity of the questions asked, the vocabulary utilized in the questions, the time to complete the interview, the skill of the interviewer, and suggested changes. Information gleaned from the test interview was used to make necessary changes in the actual interview questions. These individuals did not become part of the population of Walton's study nor of this study.

Questions utilized were created by Walton (2011) and were based on research, review of the literature, and research questions. The questions that were used in the study had five to nine semi-structured and open-ended responses. They were relevant to the design elements and physical features associated with school buildings. They were written to obtain the perceptions of elementary principals and architects on design elements that promoted safety in schools. Protocols unique to the subjects were created because some questions could only be answered by principals and some could only be answered by architects. There were five questions common to all three groups. Different protocols for principals and architects were used in order to obtain more comprehensive data.

Notes were taken by the researcher during the interview. If the researcher sought clarification on a participant's response, follow up questions were asked during the interview. After the interview, permission was requested to ask more questions by telephone or e-mail should the researcher seek clarification of responses from participants. The interview protocol included written and verbal explanations of the purpose of the study and provided instructions to participants. Interview questions were prepared in advance of meeting with principals and architects. Vocabulary related to the topic and the questions were provided to the participants prior to the interview. The questions were open-ended, neutral, and designed to elicit detailed descriptions of the views and opinions of the subjects. (Creswell, 2014).

The questions that were used for the study are as follows:

Principal interview questions:

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to your buildings now that were not in place prior to 1999?
3. What is the most dangerous place in the school building? Are there ways to design these places to minimize danger?
4. What is the most pressing safety need in your school?
5. What safety activities does your school do best?
6. What are the biggest physical barriers to improve school safety measures?
7. What other factors regarding school design do you believe affect school safety?
8. What role does the physical design play in school safety?
9. What design features have been incorporated to accommodate technological upgrades for safety and security?

Architect interview questions:

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to buildings now that were not in place prior to 1999?

3. What is the most dangerous place in a school building? Are there ways to design these places to minimize danger?
4. What are the biggest physical barriers to improve school safety measures?
5. What design features in the school have been incorporated to accommodate technological upgrades for safety and security?
6. Has the federal government or state mandated any added or different safety designs since 1999 that must be incorporated in schools?
7. Do you think that schools designed after 1999 are generally safer than those designed before that date? If so, in what ways?

Common questions:

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to buildings now that were not in place prior to 1999?
3. What is the most dangerous place in a school building? Are there ways to design these places to minimize danger?
4. What are the biggest physical barriers to improve school safety measures?
5. What design features in the school have been incorporated to accommodate technological upgrades for safety and security?

Informed Consent

Once principals were selected, permission was sought by contacting them directly. An e-mail was sent by the researcher inviting the individual to participate. To protect confidentiality of participants' identies, schools, nor school divisions were not revealed. Likewise, once selected for the study, an e-mail was sent to architects requesting participation in the study. If no response was received, then a follow up e-mail was sent. If there was still no response, the researcher attempted to contact the individual by telephone. If the individual declinded to participate or phone calls were not returned, then the next school on the list was selected for participation. Once principals and architects agreed to be interviewed, they were asked to provide consent. The consent form was e-mailed to them a week in advance of the interview.

The consent form explained the following: the purpose of the study, procedures for conducting the study, risks and benefits of particpating in the study, and steps taken to protect confidentiality. Consent from participants was obtained prior to the interview through verbal consent. Once consent was obtained, the interview took place.

Collection of Data

Participants were invited to interview either at the office of the principal, through a telephone conversation, or through face to face contact. Creswell (2014), cites telephone conversations as a valid format for interviewing subjects and gathering meaningful data.

Face to face could mean a variety of mediums. For the purposes of this study, face to face included Google Hangout as a video-conferencing format. As technology has allowed for individuals across the world to interact in real time, platforms such as Google Hangouts and Skype are becoming an acceptable method of qualitative data collection that reap the same or similar benefits of an in person interview (Deakin & Wakefield, 2013; Hanna, 2012; Janghorban, Roudsari, & Taghipour, 2014; Sullivan, 2012). The interview protocol was reviewed by the researcher's dissertation committee chair before it was used. An application was submitted to the Virginia Polytechnic Institute and State University Institutional Review Board (IRB) explaining the study and discussing any potential negative impacts from the research conducted. Once the application was approved, data collection began.

Securing of Data

Research notes, interview notes, and transcripts were kept in a locked filing cabinet that only the researcher had access to. The filing cabinet also had a key that only the researcher possessed. Digital copies of the recordings and transcripts were secured by password and fingerprint technology on the researcher's cell phone, I-pad, and laptop so that only the researcher had access. Electronic recordings of the interviews were deleted from the researcher's cell phone after the study.

Data Analysis

After the interviews were completed, they were transcribed. Transcripts were shared with the participants through e-mail to review for accuracy. After accuracy of transcripts were ensured, the researcher reviewed the transcripts and notes from the interview. The interviews

provided an abundance of data, which meant that data needed to be narrowed so that interpretations could be meaningful and focused on answering the research questions. Narrowing the data meant that it needed to be concentrated by focusing in on some data and discarding other data (Guest, Namey, & Mitchell, 2012). The researcher developed an outline that identified overall themes. Then, sub-themes were developed to support the broader themes from the study.

The process of analyzing data was part of the inductive process of working back and forth between the data and themes to establish a comprehensive set of ideas that were derived from the study (Creswell, 2014). When establishing themes and ideas derived from participant interviews, the data were coded so that themes and sub-themes were developed. Like Walton's study (2011), each group of interviews was analyzed separately. To analyze group responses, participant answers to individual questions were summarized and themes were developed. Once all group responses were analyzed, answers were compared and common themes were developed.

Phenomenological methods were used to determine meaning from the text. After findings were discussed, conclusions were drawn that distinguished this study from previous research. Furthermore, conclusions sought to draw practical meaning from participant responses that could be incorporated into designing and renovating schools, developing policy related to safety in schools, and impacting daily practices as principals seek to provide safe environments for students.

Summary of Chapter

This chapter described the methodology that was used in the study. Research questions that guided research for the study were restated. The population for the study and methods for collecting a population sample were described. The chapter outlined the research design that was utilized and identified questions that were asked of participants. The method by which data was secured and analyzed was also discussed. The method of data analysis was utilized so that themes could be drawn from the study that provided practical significance to all stakeholders involved in creating safe schools for students.

CHAPTER 4
SUMMARY OF FINDINGS

Introduction

Chapter 4 contains data from the three groups interviewed for the study. The first group included five elementary school principals that were from schools constructed prior to 1999. The second group included five elementary school principals that were from schools constructed since 2011. Both groups of principals answered the same set of nine questions regarding school design elements and the impact on the principals' perceptions of safety. The third group included five architects with experience designing elementary schools. A separate set of seven questions related to school design elements and the impact of safety within a school building was developed. After conducting the interviews, responses from each group were analyzed separately. Data from the interviews were transcribed. Then, written responses were summarized and coded. After analyzing data, emergent themes for each group and from responses to interview questions were developed and synthesized.

Group One-Principals in Old School Buildings

The five elementary schools in the first of three groups were selected because they were constructed prior to 1999. Elementary school #1 was built in 1992, had an enrollment of 579 students, and 44.42% were eligible for free or reduced lunch. The principal had 25 years of experience as a school administrator, including nine as an assistant and 15 years as principal of elementary school #1. Elementary school #2 was built in 1994, had an enrollment of 640 students, and 22.10% were eligible for free or reduced lunch. The principal had 11 years of experience as a school administrator, including nine as an assistant and two years as principal of elementary school #2. Elementary school #3 was built in 1990, had an enrollment of 140 students, and 43.23% were eligible for free or reduced lunch. The principal had 13 years of experience as a school administrator, including 10 as an assistant and three as the principal of elementary school #3. Elementary school #4 was built in 1991, had an enrollment of 600 students, and 36.75% were eligible for free or reduced lunch. The principal had 25 years of experience as a school administrator, including 10 as an assistant, 10 as a principal at another school, and 5 as principal of elementary school #4. Elementary school #5 was built in 1999, had

an enrollment of 600 students, and 70.59% were eligible for free or reduced lunch. The principal had five and a half years of experience as a school administrator, including three as an assistant, and two and a half as principal of elementary school #5.

Synthesis of Themes from Principals in Old School Buildings

Question #1 asked "Specifically, what is the most important design element, component, or feature in the school building to make the school safe?"

Principal #1 said that all exterior doors were locked so that only one door was unlocked throughout the school day. The door led to a double door foyer in the entrance of the school. Visitors who entered the foyer had to be buzzed into the office, which prevented them from accessing the school without going to the office, first.

Principal #2 said, "…being able to access people coming in and out of your building at the different doors."

Principal #3 stated that, "…being able to control who comes into your building, that you know who is coming in and out of your building, that you don't have a way for somebody to get in there….I think that's the key; access control of the building."

Principal #4 said, "Visibility of areas where students travel and where students congregate."

Principal #5 said, "The entrance of the school being such that it doesn't go directly into where the children are but rather are funneled into the office…"

Question #2 asked, "Have there been additional design elements added to your buildings now that were not in place prior to 1999?"

Principal #1 shared that the double door foyer had been added to the school during the past two years. Exterior cameras were added, "…to scan the school grounds twenty-four hours a day." They were also added to all doors so only staff members could access the building with identification badges. An emergency box was placed on the exterior of the building that contained a master key "in the event of a serious lockdown incident" so that law enforcement could access the school. Additional lights were added to the parking lot and an extra lane was added so that entering and exiting the building was safer. Classroom doors and hallways were

color coded and numbered on a map that corresponds to colors on doors and hallways in the school so law enforcement could use in an emergency. Safety latches were added to classroom doors so that doors could be locked from the inside. Finally, signs were added to identify hallways and classrooms inside the building.

Principal #2 said that a camera has been added to the entry point accompanied by a system where someone from the office staff must buzz the visitor into the main office before they can access the school. The camera allows office staff to view the individual before allowing them into the school.

Principal #3 said that a buzzer system with a camera was added to the double door entry system near the front door. This feature was added because the front door was not visible from the front office and a camera made monitoring of who entered the building a possibility.

Principal #4 said there were no additions but added that the building was "adequately safe where we are now."

Principal #5 identified three security features. The first was a wall that led individuals from the foyer into the office. Prior to installing the wall, visitors had access to the cafeteria, gymnasium, and hallway. The second feature was a buzzer that allowed individuals to go into the main office. The third was a buzzer in the assistant principal's office that rang directly to law enforcement if pushed.

Question #3 asked, "What is the most dangerous place in the school building? Are there ways to design these places to minimize danger?"

Principal #1 said, "I would have a hard time finding a place that's a dangerous part of our building." However, the principal did express concern that fire doors automatically shut during a fire drill but not during a lockdown drill. This individual wished that these doors closed automatically so an intruder could not get further into the building if they were to get past the office. Also, the parking lot was identified as being unsafe. There was a lot of traffic where cars "…don't necessarily abide by the speed limits" and pedestrians often cross in the same locations. Principal #1 said, "We have had some near misses."

Principal #2 stated that the lack of cameras throughout the school made it dangerous.

Principal #3 referenced a door near the back side of the building. There was no known reason for the door being placed in that location, but it was a "blind spot" where anyone could walk around the back of the building, enter the door, and have access to the entire building.

Principal #4 believed that anywhere outside the school building was most dangerous. This was particularly true in elementary school #4 since it contained few windows, which limited one's view of what happened outside the building. The principal stated, "Our school really needs more visibility of the surrounding grounds from inside the building."

Principal #5 identified the parking lot as the most dangerous place in elementary school #5. The parking lot was dangerous because parents often drove through at the same time that children walked through on the way to the playground. The other dangerous part of the school was the playground off the same parking lot. Since parents could go from the parking lot to the playground as the grounds were designed, individuals who drove through the parking lot would have access to students before coming into the school.

Question #4 asked, "What is the most pressing safety need in your school?

Principal #1 said, "A safe place for students who are in crisis, or students who are violent" was the most pressing safety need. The principal said, "…if I have a child who is violent or dangerous, I don't really have a place for them to go. And to me, that's a safety issue, because who are they going to hurt in the meantime and how can I keep them safe and everybody else safe at the same time and not only violent in terms of weapons, I mean physically they are going off." A solution posed by principal #1 was to have a room where students could safely and legally be isolated.

Principal #2 believed the need for more security cameras was most important followed by the need for more badge entry points on doors throughout the school.

Principal #3 said that an unmonitored back door was an important safety need. Another need was the lack of lighting in the back exterior of the building. The lack of lighting concerned the principal because someone could trip and fall. A bigger danger could be that someone who did not belong in the school could hide early in the morning or late at night away from the view of staff members, according to principal #3. Another safety need discussed by principal #3 was a "…second door which leads up to our car rider line or circle, if you will, which kids get picked up at the end of the day." This door was the only way in and out of the playground but the

principal expressed concern that the door was used so much, visitors could easily access the building without going through the main office. The concern was that there were, "…a fair number of family situations that are not the best, though unpleasant. Some custody orders that are very tense and I worry that a little second grader who sees a familiar face opens the door and a dad or mom walks in and tries to grab their child and walks out an we don't even know they are in the building."

Principal #4 said there was a need for more cameras. However, the individual did express satisfaction with the design of the building because it allowed for, "…great visibility inside the building from a lot of vantage points."

Principal #5 identified the parking lot adjacent to the playground as the most pressing safety need but questioned the feasibility of finding a solution. Another issue identified by principal #5 was a steep hill with a playground located at the bottom. The individual said that students and even adults often fell down the hill.

Question #5 asked, "What safety activities does your school do best?"

Principal #1 said that the school conducted frequent safety drills because of a schedule developed by the school division. Safety drills included fire drills, bomb threat drills, leveled lockdown drills, and earthquake drills. The principal also said that enforcement of discipline policies was consistent throughout the school. The principal said, "…everybody knows what to expect and, as a result, we have very few disciplinary referrals…" Also, an emergency guide with information about students and key procedures was available for teachers so that they know what to do and how to contact parents in the event of a crisis.

Principal #2 said that they do "lots of drills." The principal discussed cooperation with the local sheriff's department as being another area of strength. For example, a deputy often walked through the building for security checks. If the deputies had concerns after the walk through, they debriefed with the principal.

Principal #3 stated, "…because we're so small we lock down very well."

Principal #4 said, "…we pay close attention to detail in making sure that doors are locked, making sure that we never access some doors, making sure that students know not to open doors for anyone and having folks posted in different areas around the building that have clear visibility areas."

Principal #5 believed that a good plan was in place to practice drills regularly. The staff also kept doors locked at all times, which the individual viewed as an important safety feature.

Question #6 asked, "What are the biggest physical barriers to improve school safety measures?"

Principal #1 stated that cost was the biggest barrier to improving school safety. The individual referenced a safety room and the lack of funding available to construct such a room.

Principal #2 believed that money was the biggest barrier to improving the physical design of the school.

Principal #3 said that unsupervised doors were the biggest barrier and was concerned that the small size of the building left little response time should an intruder enter the school.

Principal #4 believed that the layout of the building and how it was originally created posed the biggest barrier. Specifically, the principal believed that older buildings were difficult to redesign and newer buildings were designed with safety in mind. An example of challenges posed by the design of the building was , "…we've had to be very creative about where do we put security cameras, where do we put security desks."

Principal #5 believed that money and human resources were the biggest barriers. Specifically, the principal said, "It would be ideal to have a resource officer, maybe not in the building, at least in the area more often."

Question #7 asked, "What other factors regarding school design do you believe affect school safety?"

Principal #1 spoke of the school's location and access to roads during an emergency. Due to the school's rural setting, principal #1 was concerned students would have nowhere to go if an emergency evacuation was necessary.

Principal #2 emphasized that money was a significant factor and emphasized the need for individuals to be willing to make safety a priority. This individual emphasized that many requests to improve the security of the building were ignored and said, "I don't understand why things haven't been done when they really need to be. I don't want something to happen and then go well, we should have done that, would have, could have, should have 'type of thing', and that is a concern."

Principal #3 believed that visibility throughout the school was an important factor related to school design. Specifically, the principal believed individuals in the school should be able to see who comes to the front entrance and control who has access to the school.

Principal #4 believed that individuals designing a school building should make safety a priority when they are being built rather than waiting on making changes to schools later.

Principal #5 discussed concern over windows that did not open and the reality that breaking them was the only way to exit apart from doors. The principal also said that an upgraded communication system that allowed individuals to use the intercom from phones rather than a central location impacted safety.

Question #8 asked, "What role does the physical design play in school safety?"

Principal #1 said that visibility needed to be considered. Specifically, visibility within the building so that individuals could see what was happening. As an example, the individual shared that the principal's office was moved to the front of the building so that parking lots and visitors to the main office could be observed at all times. Another aspect was the "ability to lockdown sections of the school." For example, the principal stated doors should have the ability to lock from the inside so intruders who are inside the building still would not have access to students in the event of a lockdown.

Principal #2 said that the physical design was important to safety. Doors being able to lock from the inside, for example, were given as an example of a feature that could make the school safer. The principal referenced the addition of double doors to some buildings made school buildings safer since areas of the school could be blocked off once intruders entered.

Principal #3 said, "I think that you need to balance between what are the needs of the school in terms of to conduct day to day operations and what are the needs safety wise. In other words, we need to have enough exit doors to get everybody out really safely in the event of anything….but at the same time not making it easy (to enter)."

Principal #4 believed, "It certainly would be in the top five." However, creating a culture, "…where kids respect each other, everyone respects each other" was mentioned as the most important factor in keeping students safe. Regarding the design of the building, principal #4 listed building design elements that allow for, "…easy access, visual access, easy physical access to things…being able to get to a certain area quickly."

Principal #5 gave a specific example of how a hallway design could help in case of an intruder. The school had hallways with pods at the end of the hallways. Each pod had two entrances. If an intruder came into a pod, then, "We can easily contain, like where it can become aggressive…it's easy to see, it's easy to hear, it's easy to contain."

Question #9 asked, "What design features have been incorporated to accommodate technological upgrades for safety and security?"

Principal #1 said that wireless adaptors were added to the school two years ago so there was internet access to support security cameras.

Principal #2 referenced a camera with the buzz-in system to the office in the main entrance of the school.

Principal #3 said, "In my school, honestly, not many."

Principal #4 said that little had been done other than adding three to four cameras over the last few years.

Principal #5 identified cameras that faced doors and went down hallways as additions to the building.

Emergent Themes from Principals in Old Elementary School Buildings

Three major themes that emerged from interviews with principals in old elementary school buildings were access control, visibility, and preparation. Each principal interviewed stated the importance of controlling who entered the building. Principals #1, 2, 3, and 5 said their schools added a security camera to the front entrance accompanied by a "buzz-in" system and principal #3 wanted to add more to other doors throughout the school. Principal #4 believed in not only the need to control who entered the building but also referenced the need to monitor parents and other school visitors once they gained access to the school building. An important aspect of safety for this individual was to only allow visitors to be in certain areas visible to the main office. Likewise, principal #5 identified the need to "funnel" visitors into the office rather than to locations with children as important to the safety of a school.

The location, number, and type of doors was a recurrent method to control who had access to the building. Principal #2 expressed concern that there was only one door allowing teachers and students access to the playground, which often was propped open. Individuals

could easily gain "full access" to the building should they enter through the propped open door. The number of unnecessary doors concerned principal #3. One door was repeatedly discussed because the location and lack of lighting was especially difficult to monitor. Overall, fourteen doors provided access to elementary school #3, including six in the back that had no security cameras monitoring them. Overall, the principal referenced the need for balance between "convenience" of access to the outside and "understanding" of key safety concerns. Principals #1, 2, and 3 all spoke of double doors, also known as fire doors in the building. They believed the doors had potential to be utilized by cutting off access to certain areas of the school once unwanted individuals entered the school building. One justification for controlling access, besides monitoring intruders, was the issue of contentious custody issues. Principal #3, specifically, said that children who saw someone they recognize may allow them in the building, which compromised the safety of all students.

The issue of visibility was discussed in terms of security cameras, the type and number of windows, lighting, and the design of the hallways. Security cameras provided a way for principals #2 and #3 to see who entered the building. Regarding cameras, principal #2 said, "…you absolutely can see what's going on at all the entry points of the building…it also helps solve other issues that come up throughout the day and to kind of see what's going on when you need to look at things or to investigate different things that happen." Principals #1, 3, and 4 spoke of strategically placing security cameras throughout the school so blind spots could be monitored. The number of windows in a school was cited by principals #2 and 4 as a point of concern but for different reasons. Principal #2 worried that too many windows being built in new schools created too much visibility from the outside while principal #4 identified the need to have more windows so that one could see what was happening outside the building.

Visibility in hallways by using cameras or through clear lines of sight was viewed as important by two principals. Elementary school #1 was shaped like a "U" which allowed the principal to, "stand in the main hallway and…see a fair amount of what's going on in the building." Principal #4 echoed the need for visibility so that areas where students travel or congregate can be clearly monitored. If hallways were designed to promote clear lines of sight throughout the building, principal #4 stated that the need for security cameras would be reduced.

Other themes that emerged from the interviews included the need for more funding and the value of preparation for dangerous situations. While discussing barriers to improving the

design of school, three principals alluded to cost. Grants were the only way to obtain funding to make "major adjustments and improvements" according to principal #1. The issue of inequality in funding was raised by principal #2, "There are other schools in my district that were built about the same time and…because they are a Title I school they have cameras throughout their building and I don't." Principal #3 wished for more lighting but stated that funding was an obstacle. Each principal believed that preparation for an emergency was something their school did well. Various safety exercises like fire, bomb threat, leveled lockdowns, intruder, and earthquake drills were referenced. Principals #4 and 5 spoke of close attention to details like keeping doors locked, not allowing individual access to some doors, and reinforcing the importance of not opening doors for anyone to students.

Other concerns safety features and concerns were noted only by individual principals. Doors that locked from the inside were important to principal #2. Classrooms that had adjoining doors so that one class could enter another class were cited by principal #3 as an additional barrier to those who entered classrooms uninvited. Principal #4 believed that a culture of respect was the most important issue related to school safety. The lack of storage space in elementary school #3 disrupted the flow of traffic since items had to be stored in areas where students traversed. The rural location of elementary school #3 was also a concern that could lead to isolation since it operated on only one phone line and did not allow for cell phone service. However, principal #5 believed that a rural location may be helpful in keeping the school safe since individuals may not think to visit an isolated location. Principal #5 also focused heavily on the exterior of the school as most dangerous and, specifically, identified a steep hill as a danger to teachers and students. Finally, principal #1 referenced violent students who needed a place to "calm down" as an issue that could not be solved within the current building structure. The individual stated, "…so if I have a child who is violent or dangerous, I don't really have a place for them to go. And to me, that's a safety issue because who are they going to hurt in the meantime and how can I keep them safe and everybody else safe at the same time and not only violent in terms of weapons, I mean physically they are going off."

Group Two- Principals in New School Buildings

The five elementary schools in the second of three groups were selected because they were constructed since 2011. Elementary school #1 was built in 2012, had an enrollment of 952

students, and 10.91% were eligible for free or reduced lunch. The principal had 16 years of experience as a school administrator, including two as an assistant and six years as principal of Elementary school #1. Elementary school #2 was built in 2012, had an enrollment of 950 students, and 58.21% were eligible for free or reduced lunch. The principal had seven years of experience as a school administrator and five years as principal of Elementary school #2. Elementary school #3 was contracted to be built in 2015 and will be finished in 2017. While the principal still served in the old school building, the individual was involved in the planning and design phase of the new elementary school #3. Due to the principal's involvement in the design process, the individual was still able to speak to school building design features that were important to keeping schools safe despite the lack of experience working in the new school building. It had an enrollment of 606 students and 21.22% were eligible for free or reduced lunch. The principal had 15 years of experience as a school administrator, including four as the principal of elementary school #3. Elementary school #4 was built in 2014, had an enrollment of 406 students, and 27.93% were eligible for free or reduced lunch. The principal had 16 years of experience as a school administrator, including six as an assistant and 10 as principal of elementary school #4. Elementary school #5 was built in 2012, had an enrollment of 459 students, and 50.77% were eligible for free or reduced lunch. The principal had five and a half years of experience as a school administrator, including four as an assistant and one and a half years as principal of elementary school #5.

Synthesis of Themes from Principals in New School Buildings

Question #1 asked "Specifically, what is the most important design element, component, or feature in the school building to make the school safe?"

Principal #1 said that cameras were the most important component and described an incident from "a couple of years ago" that precipitated adding more safety measures in the school. The mother of one of the students was murdered by her boyfriend then came to the school and killed himself. After the incident, elementary school #1 added more cameras and a buzz in system, which, "…changed the nature of our school."

Principal #2 identified the "structure of the main entrance" and described the buzz in system at the school where, "…the main front door that you can buzz through, however you cannot walk through the second set of doors without entering through the office."

Principal #3 stated a "strong video system" throughout the hallways and at the doors.

Principal #4 said that cameras outside and inside the building allowed for more effective monitoring of the building. The principal also said that each door could be locked from inside the room.

Principal #5 stated that the security of the building that governs how people enter and exit as the most critical design element. The principal emphasized that schools should have a system where visitors, "…can be given access based on some criteria…" like a key or keycard.

Question #2 asked, "Have there been additional design elements added to your buildings now that were not in place prior to 1999?"

Principal #1 said that a buzz in system to the main office was added.

Principal #2 said there had not been additional design elements added to the building.

Principal #3 identified an increase in security cameras and a safety lock at the entrance where visitors had to be buzzed in.

Principal #4 said intercoms that could be heard outside the building were added.

Principal #5 said that identification badges were added to scan in and out of the building.

Question #3 asked, "What is the most dangerous place in the school building? Are there ways to design these places to minimize danger?"

Principal #1 stated that the school had a lot of windows, particularly in the stairwell and front office lobby area. Moving students to areas where they would not be visible during an emergency was described as a challenge.

Principal #2 said the stairwells were the most dangerous part of the school. Specifically, the structure of the handrails was dangerous since they frequently broke. Principal #2 stated that the handrails were, "…designed for more aesthetics instead of for safety." The other part of the stairwells identified as dangerous was the "…structure of the steps…are awkward as far as the sides and the angle of the steps themselves which makes it very awkward for students and staff members to walk up and down on a regular basis." Another dangerous feature was the

"…alcoves within the building…" where students could go to hide or get hurt without being noticed.

Principal #3 said that the back or side doors to the building because individuals could get in and out without being monitored. The principal also stated that stairwells and bathrooms were most dangerous due to the lack of cameras monitoring them. In elementary school #3 there was a back stairwell used infrequently, which made, "…an easier place for something to happen." The principal discussed a need for "checks' throughout the school in the form of monitoring by staff or security cameras.

Principal #4 identified the cafeteria as the most dangerous place because so many windows allowed someone from the outside to see in side. The principal feared, "…probably somebody with a gun could just shoot their way in there."

Principal #5 believed that the cafeteria was the most dangerous place in elementary school #5. The reason was that there were many windows and natural lighting, which exposed large numbers of students at a time to the "general public" from the outside. Also, principal #5 said that, if there was an emergency, the large number of students in one place made the cafeteria difficult to lock down.

Question #4 asked, "What is the most pressing safety need in your school?"

Principal #1 expressed a desire for more security personnel. However, the principal did state, "I don't like the idea of them walking around with a weapon on anyway. That would be weird for an elementary school. What would be the psychological impact on that?" Principal #1 also believed more video cameras were needed since many incidents were often not visible on camera during investigations.

Principal #2 believed that the school was a "pretty safe environment." On the outside of the building, however, the bus port was described as dangerous since individuals drive down it while traveling from one road to the other. The danger was that the area was difficult to monitor when students were dismissed to get on school buses.

Principal #3 said, "I want a strong video system where I can see and monitor and keep an eye out on what's going on in all hallways and certain areas and everything." Specific areas of concern that could be better monitored through cameras in elementary school #3 were back doors and parking lots.

Principal #4 believed that the school needed more radios to assist with communication within the building.

Principal #5 discussed classrooms that were connected through adjoining doors. Once someone entered the main door to a classroom, they would be able to go into another room. The concern for principal #5 was, "So if we go into a lockdown and one teacher does not lock their door in time or properly, if there was an intruder, they'd have access to that whole wing there. What I've been told is that the doors in between classrooms can't be locked." Another issue identified by the principal was that doors often did not latch properly despite many requests to have them fixed.

Question #5 asked, "What safety activities does your school do best?"

Principal #1 stated that individuals were, "cautious within the building" and had a "knowledge of procedures" because of practice drills.

Principal #2 said that the school practiced lockdown drills "several times" and recognized the staff as doing, "…a very good job with that." The principal also stated that fire drills were executed well, citing the challenge of getting over 900 students, including six classrooms with students in wheelchairs out of the building quickly.

Principal #3 said that, "…everybody has to check in, nobody can enter." Teachers, staff, and students were trained to tell anyone who wished to enter the building that they had to go to the main office. The principal said, "So we're really good about that piece, making sure of that. And then we check everybody's identification when they enter the building, it doesn't matter if they've been here six years, every time they come in they have to show their ID."

Principal #4 discussed that the school had, "…a crisis plan in place, we really walk through the scenarios, as a matter of fact, we have a lot of lockdown drills." After safety drills, the staff came together to reflect on problems or questions that arose during the drills.

Principal #5 spoke of a prepared staff that, "…did a pretty good job with our lockdowns." The individual also discussed a "…mentality of if something doesn't seem right or if something seems strange you just kind of bring attention to it or try to figure it out. We're kind of a community here if something doesn't seem right let's investigate it."

Question #6 asked, "What are the biggest physical barriers to improve school safety measures?"

Principal #1 identified the layout of the building since it impacted how students traveled in the hallways and up and down the stairs. The concern was that close to 1,000 students traveled at the same time, but principal #1 speculated that the building was designed for fewer individuals to travel at the same time. Another barrier identified was the ease with which doors could be opened. The individual wished that doors should be, "…more challenging to open up."

Principal #2 was concerned about, "…physical structures that children can get behind or get around where they're not visible to the naked eye or to the cameras." The principal described elementary school #2 as, "…a big open building but there's a lot of spaces that are not necessary." The spaces created situations where students often hid in spaces because they knew cameras would not see them.

Principal #3 cited outside doors since they provide more opportunity for people to enter the building. An example described was that back doors had to be propped open for students when traveling to and from trailers since they could not have a passcode or a key. Principal #3 believed that propping doors open meant the building remained unsecured at all times

Principal #4 expressed fear that staff or students would be outside during a shooting because there was a lack of physical barriers to protect students. Otherwise, principal #4 believed that the school was "pretty safe."

Principal #5 believed visibility was the biggest barrier. Principal #5 was also concerned that, once a person gained access to the main office, that there was no way to limit access to the schools. Another physical barrier was the design of the school itself. To quickly move from one hallway to the next in elementary school #5, one had to go outside to avoid a long walk.

Question #7 asked, "What other factors regarding school design do you believe affect school safety?"

Principal #1 believed that funding impacted school design. The principal also believed that two-leveled schools were unsafe due to vulnerability to tornados and other weather-related issues. Finally, principal #1 returned to the cafeteria and gym as unsafe areas, citing the challenges of finding a place for them to go during a lockdown drill.

Principal #2 said the way individuals get in and out of a building impacted safety. The number of entrances was also cited as a concern because of the difficulty of monitoring all doors. The individual said, "…to me there's a lot of ways for somebody to enter the building where you

can't man it all the time…so I would just say making sure that not just the interior of the building is safe but the way that it can be accessed from the outside is extremely important."

Principal #3 believed that each door should stay locked so that individuals had to go to the main office to enter the building.

Principal #4 said that the layout of the building affected school safety and the location of security cameras.

Principal #5 said, "…access points, how do people have access, how easy is the access." Question #8 asked, "What role does the physical design play in school safety?"

Principal #1 said, "I think it really should be at the very start" and wondered how much "security personnel" was involved when designing schools.

Principal #2 stated, "I would say on a scale of one to ten, I would probably say it's an eight. So to me it is extremely important." The principal identified an open model as an effective structure to help with monitoring students within the building.

Principal #3 said that the physical design was "very important", adding, "Sometimes buildings are designed more for aesthetics and what's going to look good on the ribbon cutting. What sometimes is practical and safe isn't always the most prettiest to look at, so to speak."

Principal #4 stated, "I think every afternoon at your building and the once you enter your building, you have to… play the scenarios. I think sometimes you just design the building the best that you can, thinking of different scenarios as you are designing the building and I think it comes to responsibility of the people and the admin.'s ability to go to different areas and say okay, if the kids are at the gym, where are we going to put them? If the person comes in our gym…what should you do? So I think that after a certain point, you just have to look at your building because no building is going to be a 100% safe, and the architect cannot imagine ...you just never know what's going to happen or who is going to get in the building."

Principal #5 believed that the physical design of a school played a "critical role." The principal viewed the physical features of a building in terms of adding a "layer of protection…extra defense, extra security, and safety for the school."

Question #9 asked, "What design features have been incorporated to accommodate technological upgrades for safety and security?"

Principal #1 identified video cameras and buzz in systems as "helpful" upgrades.

Principal #2 said that the school had, “ninety cameras” located at different angles within the interior and exterior of the building. A buzz in system was also installed at the front door, cafeteria, building docks, and certain doors so that visitors could not enter without someone seeing them on camera, first. Each door also had a key pad, allowing principal #2 to know who and what time individuals entered a building.

Principal #3 identified the way doors were locked from the inside and outside now as opposed to only locking from the outside in older building.

Principal #4 said that the school added a buzzer and a swipe system to monitor who entered the building.

Principal # 5 identified a camera that allowed office staff to see visitors entering the building and identification card readers as two additions designed to provide safety and security in the school.

Emergent Themes from Principals in New School Buildings

The four major themes from principals in new school buildings were access control, visibility, movement within the building, and preparation. All five elementary schools had buzz in systems to give greater control over who entered the school building. Principal #2 identified the ability to monitor the front entrance as the most important safety design in a school and “how we get in and out of the building” as important factors. Principals #2 and 3 discussed the difficulty of monitoring all doors as a barrier to access control and expressed a desire to be aware of who entered the building from locations other than the main office. Principal #3 described a system where visitors had to check into the school twice before entering the main office. Upon entering a small hallway in elementary school #3, an individual was buzzed into another door. Once the visitor entered that door, they were buzzed into the main office to sign in. Another concern related to access control was identified by principal #5. The principal wished that the building design allowed for controlling access to different parts of the building once they entered through the main office. For example, the individual wished double doors would automatically close in case of a lockdown.

A sub theme to the topic of access control was the number and type of doors in elementary schools. Principals #1, 2, 4, and 5 described specific features of doors that would make it possible for schools to monitor access to the building. Principal #1 said that doors

"…should be more challenging to open up" and that they should automatically shut after using. Principal #2 said that all doors should be "key padded." Principal #3 expressed concern about having too many doors and lamented the difficulty of keeping them always locked. Principal #3 did add, however, that doors in new schools could be locked from the inside and outside, which was seen a positive safety feature. Principal #5 described adjoining classroom doors as unsafe since one teacher who failed to lock the door might expose the other classroom to danger.

Three of the five principals interviewed identified security cameras as an important factor in creating more visibility in the school. Principal #1 cited the need for more cameras since incidents often led to inconclusive investigations because they happened out of the view of cameras. Specifically, cameras should be placed at alcoves within the building or places, "…that are tucked off that has spots you can't see when you go through them" according to principal #2. Principal #2 believed that if cameras were not strategically placed near alcoves, students would go into those places and, "…do things that could get themselves in trouble or get themselves hurt." Cameras should also be placed throughout hallways, outside all doors, in easy to hide areas like stairwells, and outside of bathrooms, according to principal #3. Not only did principal #3 wish to have a video system to monitor activity inside the building, security cameras were needed outside to monitor who entered the building and parking lots.

The number of windows was discussed by three principals as factors in keeping schools safe. Principal #1 wished to see bigger windows to "minimize danger" so that, "…everyone can see if someone is walking up with a gun." The principal also said that more windows made schools safer because they created more natural light, which allowed for greater visibility. However, principals #3 and 5 believed more windows were detrimental to school safety. Principal #3 stated, "…if somebody if driving by they can see my entire cafeteria and see it's filled with food because it's so many windows out there. And I asked them, 'Is that a safe thing?' and they're like, but it looks better from the outside, not having the windows that are holding a solid brick wall." Similarly, principal #5 believed the cafeteria was the most dangerous part of elementary school #5 due to the number and location of the windows. The cafeteria, according to the principal, was exposed to anyone driving on the main road.

The design of a building was perceived by principals in new schools as having an impact on how individuals moved throughout the school. Principal #1 was concerned about the high number of students passing through the school at once and the potential to create unsafe

situations. Stairwells were identified as dangerous by principal #2. Handrails broke frequently because they were, "…designed for aesthetics instead of for safety" and the design of the steps created "awkward" angles for students and staff to travel on. The inability to quickly get from one area of the school to another was cited by principal #5 as a disadvantage in the design of a school. The principal wished that the school would have a triangular design so that individuals could get across the school without going, "…all around the building or outside."

All principals identified preparation for an emergency as something that their schools did well. Principal #1 believed that the design of a building can be an obstacle to preparation, citing the difficulty of preparing for a lockdown if students are in the cafeteria. Principal #3 said that administrators should, "…be vigilant about making sure your staff truly understands the process and policies and procedures…truly understanding of what's going on and what's happening and why the policies and procedures are in place." Principal #2 and 3 emphasized the importance of all staff members, including office staff, teachers, and custodians as having a role during lockdown drills, which made the school staff better prepared for emergencies.

A secondary theme resulting from interviews with the second group of principals was conflict between aesthetics and safety. Principals #2 and 3 believed that focusing on the appearance of a building often conflicted with what they believed was a safe environment. Referring to the high number of windows in elementary school #2, the principal stated, "…architects like to make buildings that are aesthetically pleasing and they do a lot with making buildings look pretty but the building being accessible is really to me what can affect the safety of the school building." Principal #2 went on to say that the school was, "…designed for aesthetics instead of for safety" citing the design of the steps as an example. Similarly, principal #3 said, "…sometimes buildings are designed more for aesthetics and what's going to look good on the ribbon cutting. What sometimes is practical and safe isn't always the most prettiest to look at, so to speak."

Group Three-Architects

The five architects in the third of three groups were selected based on having experience designing elementary schools. Architect #1 was an architect for over 30 years and designed "around 25" elementary schools. Architect #2 was an architect for 12 years and designed five or six elementary schools. Architect #3 was an architect for "almost 40 years" and designed "eight

to ten" elementary schools. Architect #4 was an architect for 43 years and was involved in designing of "a range of thirty" new or renovated elementary schools. Architect #5 was an architect for "almost thirty" years and designed "maybe ten" elementary schools in addition to a variety of elementary school building renovations.

Synthesis of Themes from Architects Interviews

Question #1 asked, "Specifically, what is the most important design element, component, or feature in the school building to make the school safe?"

Architect #1 placed safety into two categories. The first was "…safety regarding the use and operation of the school…" and "…safety regarding prevented, unwanted people, or activities in the school." The architect believed that the latter was the most important for architects to consider when designing schools.

Architect #2 identified circulation, "…as it pertains to the site and in the building. How are you controlling the movement of buses, cars, people, service, emergency vehicles, etc. How you're controlling all that and help things flow through the building and through the site."

Architect #3 identified the "…building design in general….there are buildings that are designed that lends themselves and other designs that do not lend themselves to a safe environment." The architect continued, "…it has a lot to do with what you have to do as an architect to apply with building codes." As an example, the individual identified clear circulation that encouraged supervision and observation.

Architect #4 believed that a safe building was "…being in a building that you really want to be in to start with." The architect discussed that safety could have different meanings for different people but one important aspect of feeling safe was a "logical circulation system." This was so, "…a child feels like they can get around from point A to point B if they need to on their own, they're comfortable with that."

Architect #5 believed that "…after everybody has arrived and been safely allowed into the building, that locking down of the entire facility and only having one access point to the building."

Question #2 asked, "Have there been additional design elements added to buildings now that were not in place prior to 1999?"

Architect #1 discussed Sandy Hook Elementary as the incident that led to the most rapid changes. “Control of entry” and making the administrative offices the focal point of a school building were two of the most prevalent changes.

Architect #2 discussed that a recent design element of many school schools was a “secured vestibule condition.” Previously, the vestibule was used to “…keep the HVAC system in check.” More recently, it served as a security measure that “…interfaces with the administrative areas so that you can’t get free run on the school without actually being granted that access.”

Architect #3 identified “hardware access control” that controlled how individuals got into schools.

Architect #4 said that designing fewer doors in the building as possible and providing a key system so “a normal person” could not enter without accessing the office.

Architect #5 discussed changes related to visibility in an elementary school. For example, the architect identified more glass, blinds, and other features that allow students to be more visible to teachers.

Question #3 asked, “What is the most dangerous place in a school building? Are there ways to design these places to minimize danger?”

Architect #1 said that the places that were hidden were the most dangerous. As examples, architect #1 referenced locker rooms, hall lockers, and closed stairwells as locations with limited visibility. Other areas that were of concern to the architect were “open spaces” like cafeterias and gymnasiums because someone could easily knock on a door, a student could let them in, then they would have access to a “room full of people” who were very vulnerable. The individual believed that some of these locations could be designed to minimize danger. As an example, architect #1 said that in locker rooms, the location of the coach’s office, the amount of glass, and designing lockers to be low would create better opportunities for supervision. Similarly, the architect said that libraries could be deigned with low book shelves to promote better supervision. Regarding the cafeteria or gymnasium, the architect said that control of entry could be achieved through limiting entry ways and exits ways in the building.

Architect #2 identified restrooms as the most dangerous part of a school. The architect discussed the evolution of restroom design to make it safer. In the past, restrooms would,

"…have a door off the corridor into the restroom, swinging into the room." This design would allow someone to barricade the door to prevent others from accessing the restroom. Newer restrooms were designed to have no doors, except inside the stalls themselves. The design allowed for all of the restroom, except stalls and urinals, to be visible from the outside.

Architect #3 believed that maintenance rooms at schools were the most dangerous locations.

Architect #4 believed that doors located away from the main office were the most dangerous. The architect discussed the challenges of controlling those who entered buildings while meeting building codes that require doors in specific locations.

Architect #5 identified the hallways and locker rooms as the most dangerous place in a school but qualified the answer by stating that elementary schools tend to be less dangerous since they rarely have locker rooms. In elementary schools, architect #5 identified the importance of having visibility and "passive security locations" to eliminate supervision problems. The architect identified an example of "passive security" as a teacher center being located at the end of a hallway with a vision panel, making it more likely for an adult to be nearby surveying the hallway.

Question #4 asked, "What are the biggest physical barriers to improve school safety measures?"

Architect #1 discussed the need for maintaining "balance" in maintaining a safe environment. For example, the space between classrooms and corridors needed to be carefully designed to create visibility between the spaces. However, the openness could be a challenge if a shooter entered the building and had "full visibility" of students.

Architect #2 said money was the biggest barrier. The individual also described the need for "balance" in designing buildings that are safe and visually appealing. Another topic identified was "control of the temperature."

Architect #3 believed that that "non-physical barriers" were most problematic. The individual continued, "…making sure that people that run schools on the operation side truly understand what the issues are and what promotes safety. So it's the non-physical I think honestly is more challenging and that they understand what the goals are and that they do it."

Architect #4 believed that money was a physical barrier. Another issue discussed was natural light since stakeholders often want this feature in a school. The architect described

interviewing teachers as part of the building design process, "If you talk to a teacher and you ask her to tell you five things that are important to her in her classroom. The first one this operable windows, electrical outlets, enough room, a good teaching wall, a good lighting system, and they have their own thermostat…and I'm telling you, you can go to five thousand schools and those are the first six things you'll hear from a teacher."

Architect #5 discussed the conflicting demands of creating a safe school with desired components of a learning environment. The architect described building design as a "series of compromises." Specifically, the individual identified "extended learning areas", which are defined as "…a breakout space where students can go out and work on an individualized project or receive special instruction by a special teacher in small groups…in a space that is visible from the classroom." These learning areas were made possible by designing them so there was visibility from the classroom. The conflict was between allowing for high visibility and the ability to lock down quickly in times of emergency.

Question #5 asked, "What design features in the school have been incorporated to accommodate technological upgrades for safety and security?"

Architect #1 identified features used to control access to a school like upgraded locks, card readers, or "proximity" readers. Additionally, the individual identified more effective methods of making emergency calls through a telephone access system or a schoolwide system where a lockdown could be called from any location. Security cameras were also identified as recent technological upgrades.

Architect #2 discussed having individuals scanning identification cards when they enter schools as a deterrent. Architect #2 also identified hardware on doors in classrooms as an area that has evolved due to technology and predicted that many changes would be seen during the next few years.

Architect #3 said that most changes regarding technology have been about access control. As an example, the architect described a recent renovation project where most of the redesign was to upgrade the security desk, the security vestibule, and install firmer doors in staff areas in the entrance area of the school. The other technological upgrade identified was use of security cameras in high traffic areas and entrances.

Architect #4 identified recent technology related to controlling access to the building. An example used was that a recent renovation project installed a button on the secretary's desk. If pushed, all doors in the vestibule space would lock before an individual entered the office if the secretary felt the person was dangerous. Architect #4 also believed that installing cameras was a new technology design. The architect did state, however, "And you know, you want to design as much as you can to keep the camera numbers down but they're certainly very valid and they're certainly great. For instance, for identifying a person later by the police and that sort of thing."

Architect #5 said that the ability to provide cameras and visual supervision throughout a school was becoming more common because they are less expensive. The individual said, "…its pretty commonplace as that technology is more affordable, works much better, saving all the data and information is much easier."

Question #6 asked, "Has the federal government or state mandated any added or different safety designs since 1999 that must be incorporated in schools?"

Architect #1 said that the changes to the Code of Virginia were related to "fire safety issues" but was, "not aware of any safety laws that had come down." However, the architect did reference that grants had been used for security purposes.

Architect #2 stated that building codes were most related to "…life safety as it pertains to fires mostly or fires and panic situations."

Architect #3 said that guidelines provided by the Commonwealth of Virginia were meant to recommend safe changes but there were few mandates. The federal or state government only dictated "performance requirements", in this architect's experience, if grants were provided.

Architect #4 said any features required were in "…building codes and restrictions, sprinkler systems, corridors, that sort of thing."

Architect #5 said that Virginia reviewed plans and provided some "minimal guidelines." The architect stated that the guidelines were not mandates, however. Also, there were no federal mandates for safety, according to the individual.

Question #7 asked, "Do you think that schools designed after 1999 are generally safer than those designed before that date? If so, in what ways?"

Architect #1 believed that schools were safety because there was a "heightened awareness" of the need for safety, particularly concerning the "control of entry" and promoting supervision.

Architect #2 stated that buildings designed many years ago did not necessarily look the same today as they did when designed. The architect said, "You think of them as being sort of frozen in time but they're really not. They're constantly evolving." Architect #2 believed that buildings could be renovated or updated to be as safe as modern day schools if the original design allowed for it. Examples of additions that made schools safer were adding vestibules that controlled who accessed the building or adding security cameras. If changes like that were made, architect #2 said, "Will it be as good as something built today? Probably get pretty darn close." Some schools, however, had the administrative offices located in the center of the school. If a school was designed that way, then there would be no way to reconfigure it to monitor access of individuals into the school, which made architect #2 believe that school would remain unsafe.

Architect #3 believed that schools were generally safer and the last five, especially, years have seen a "tremendous amount of change."

Architect #4 believed that schools were generally safer but, "It depends on the architect you pick…how innovative they are and how cutting edge they are."

Architect #5 believed that schools were generally safer, "Certainly there is an understanding that those issues are out there and we are addressing them…" As examples of safe features that had been recently added, the architect identified single entry points and more affordable technology.

Emergent Themes from Architects

The three emergent themes from interviews with the architects were visibility, access control, and the need for balance in designing schools. Access control was the most prevalent theme discussed by the architects. All five believed that access control was the most important building design element in keeping elementary schools safe. Architects #2 and 3 described methods of controlling who entered the building in terms of "hardware" changes over time. Architect #2 referenced hardware on the classroom door locks, specifically as an area of building design where, "…you're going to see a lot more evolution happening" in the next few years. Architect #3 said a wide open interior environment was a feature of schools from years ago.

However, modern buildings were designed to prevent direct access to the school since schools forced visitors into areas that were supervised. Architects #1 and 3 spoke of recent building designs had fewer doors. When entry and exit ways were limited, school personnel would be able to monitor those who entered the building. Architect #5 described limiting access of visitors as "having one access point to the building" and identified a buzz in system as a consistent component of recent projects.

Renovation projects and technological upgrades have created a greater capability for controlling who accessed school buildings, according to four architects. Architect #5 stated that technology like security cameras and increased supervision were made possible by lowered costs of additional technology. Architect #3 described involvement in renovation projects where entrances were redesigned, security desks were either added or upgraded in the front of the school, security vestibules were added, or firmer doors were placed in staff areas. Architect #4 described technological upgrades, specifically in vestibules. A recent school designed by architect #4 allowed the office secretary to lock all doors in the vestibule area leading to the office by pushing a button, if a dangerous individual tried to access the school. Architect #2 described a system in the main office where individuals scanned identification cards. Then, the computer "checked the database" and "provided" a sticker for the visitor, if they were cleared.

In terms of access control, architects discussed specific changes to building designs that have taken place in recent years. Architect #1 and 3 both believed that the past four to five years had been times of great change in building design. Architect #4 discussed that many kindergarten and first grade classrooms in older buildings had direct access to the outside. Modern buildings, however, eliminated those features. Architect #2 said that the security vestibules in front of schools used to "keep the HVAC system in check" but had been redesigned as security measures. Within classrooms, architect #4 discussed how window design has changed to "…better serve the teacher and the student." This architect designed elementary schools with one window in the back of the room so that there was still natural light and "…a connection to the outside." However, the location of the window allowed students to get to the corner of a room during a lockdown and be out of a predator's sight.

The second theme that was prevalent during architect interviews was visibility within the building, which impacts supervision. Each architect discussed the importance of designing elementary schools in such a way that hallways and other areas where students travel could be

monitored. Architect #1 described the most dangerous areas in a school as locker rooms, hallways with hidden places, and stairwells with limited visibility because they were difficult to monitor and shared that the consensus of administrators while working with school systems was that they wanted the ability to supervise students. Architect #3 described supervision as "…clear and defined circulation…so that it's not a maze, it's not confusing." Architect #4 described a "safe building" as one where individuals wanted to be. A "logical circulation system" where a child could move from one place to another in a comfortable way while being supervised by adults was the most important part of a safe school.

One reason for designing schools that promoted greater supervision was to discourage bullying, according to three architects. Architect #1 believed in the importance of controlling access to the building from the exterior but that supervision from the interior would prevent bullying. Architect #4 shared personal experiences with bullying as a reason why supervision was important. The architect stated, "…when I was a kid I would not go into the restroom because I always got picked on…it's not just a predator out there trying to get into the school, it's the bullying and all of that that can make you not want to be in a school, if you're on the wrong end of bullying." Architect #2 also believed that supervision created a safer learning environment for students, particularly in restrooms and locker rooms. The individual stated, "…children and their perception of whether or not they feel safe…" was determined by if a building felt more "open" rather than if "…they're going into some room and the door is closed and nobody knows that they're in there and can't hear them." While Architect #4 believed that cameras were an important part of supervision, the most important role of building design was in preventing unsafe situations. If a building was designed to promote better monitoring of students, then unsafe situations may be avoided.

Three architects believed that the exterior design had an impact on supervision. Architect #3 said that the exterior should have a simple design, "…versus one that's broken up with a lot of hidden areas that don't provide a clear line of sight…" When the exterior design encouraged "clear circulation" of buses, people, and service and emergency vehicles, according to Architect #2, individuals were as they accessed the building could be monitored while having a safer path into the school. Architect #4 discussed the importance of landscaping to promote supervision. The individual referenced "landscape elements" like keeping tree branches from growing too low so individual could hide in them.

The need for balance between safety and aesthetics was the final theme of interviews with architects. Architect #5 described building design as a "series of compromises." Architect #3 said, "…there's a lot of discussions in school design today. If we should have transparency or opaqueness, versus building design. There's a school of thought that says the more transparent the school is, the more opportunities you have to identify when there is a problem." The architect had worked with individuals from "both schools of thought" and believed that there was strong support for both sides among those who designed schools. Architect #2 described one extreme, "You can make the safest building in the world, it has no windows and looks like a prison and is built like a prison because it keeps people out and keeps those kids in." Architect #1 echoed the description but expressed disagreement with those who stated, "We can't have any windows in the cafeteria that's lower than six feet high because you know the shooter, it's just too inviting for a shooter." Architect #1 called for balance in school design. This belief was justified by stating those with intent to enter schools still have many opportunities and would be difficult to stop regardless of the design of the building. The architect's major concern regarding safety was not, "…the horrific, hostile, intent to kill…but the angry parents that's involved in a divorce, and one tries to get the kid…" Architect #1 also described the importance of an open school design and that it made schools safer. In an open school design, "The corridor is inherently more supervised or open or visible to more people. On the other hand, if you had the lockdown scenario where you have an active shooter, the concern is the shooter has just got full visibility of students so…that question of transparency is usually an issue, more about transparency and safety balance."

CHAPTER 5
SUMMARY AND CONCLUSION

Introduction

Chapter 5 contains a description of the data, conclusions, a discussion of findings, implications for practitioners, and recommendations for future research based on results of interviews conducted. Perspectives of all three groups of individuals was sought to understand what they believed were the most important design elements of an elementary school building that led to a safe school.

Description of Data

Data collected for the study were gathered using qualitative methodology. The methodology used to collect data from the study was a replication of Walton's study (2011). Walton's study focused on high school safety while the present study focused on elementary school safety. Principals from elementary schools built before 1999, principals from elementary schools built since 2011, and architects with experience designing elementary schools were included as participants in the study. Both groups of five principals answered the same set of nine questions regarding school design elements and the impact on the principals' perceptions of safety. The third group included five architects with experience designing elementary schools. Participants were interviewed individually and responses were recorded. After the interviews were transcribed, data were summarized and coded. Themes for each group were developed and analyzed based on responses of participants. A separate set of seven to nine questions related to school design elements and their impact of safety within a school building was developed. Each of the three groups answered five common questions. Data from each of the three groups was collected and analyzed. After analyzing findings from each of the three groups, themes from all three groups emerged.

Summary of Findings

The primary purpose of the study was to collect data and examine beliefs of elementary school principals and architects about what they believed were design elements that influenced safe elementary schools. The shooting on April 20, 1999 at Columbine High School was a significant event in shaping school safety since it brought a sense of national urgency to the issue

of safety in schools (Fowler, 2013; Skiba, 2000). Since 1999 was a pivotal year in the development of modern day school safety, schools built before 1999 were selected as participants in the study. Participants in the study, however, were more likely to reference the events at Sandy Hook Elementary on December 14, 2012 as influential on how schools were designed to promote safety. In fact, the last five years appear to be the time of most rapid change in building design, according to those interviewed. After analyzing the perspectives of principals and architects, the data revealed that there are certain design elements that can be constructed or added that will influence perceptions of safety within elementary schools.

The main research question for the study was:

What are the design elements that principals and architects believe influence a safe elementary school?

The two sub-questions that also guided research for the study were:

1. What design elements would an architect think influence school safety?
2. What design elements would an elementary school principal think influence school safety?

Overall, the physical design of the building was seen as having an influence on safety in schools. The two common themes from all three groups were access control and visibility. Each individual participant believed that controlling the access of individuals who attempted to enter a school building was a very important component of a safe school. Many expressed a desire to design schools so that access to different parts of the building could be controlled once an individual was granted access. A common method of access control was a buzz in system in the front of the school. All new elementary school buildings had some type of buzz in system while the most frequent upgrade to old school buildings was a buzz in system.

Controlling entry through the number, type, and location of doors was a frequently mentioned component of access control. Individuals in both groups of principals expressed concern about too many doors in the building and the difficulty of monitoring them. Some architects also believed fewer doors were an important component of keeping schools safe. However, the architects who discussed doors did understand that the number of doors was determined largely by the Code of Virginia as it pertained to fire safety regulations. A final method of access control brought up by both principals and architects was a swipe in system in

the main office so anyone who wished to enter the building could be screened for safety prior to entering the building.

Visibility was the second common theme among all three groups that were interviewed. Individuals from each group expressed the belief that clear lines of sight were the best way to supervise students. The design trend was for a more open design in schools that allowed for a consistent flow of traffic as well as the ability to monitor students as they traversed hallways and congregate in hard to monitor spaces like restrooms, locker rooms, and stairwells. Security cameras were the most frequently mentioned tools used to monitor the interior and exterior of the building. Windows were frequently mentioned design elements by principals and architects, but they disagreed on the role of windows in influencing school safety. Principals tended to view windows as contributing to an unsafe environment, specifically those that allowed individuals outside the building to view individuals on the inside. In fact, two principals specifically stated that architects seemed more concerned with aesthetics than safety. Architects, however, tended to emphasize the importance of visually appealing aspects of a school, like windows. They believed that schools could maintain a balance between safety and aesthetics.

Another theme that emerged from both groups of principals was the importance of preparation for emergencies. Most principals expressed pride at the amount of preparation from staff as it related to school safety. They emphasized the importance of knowing the layout of the school and creating emergency plans based on the unique characteristics of their building. Methods of preparation included fire drills, bomb threat drills, leveled lockdown drills, intruder drills, and earthquake drills. When discussing preparation for emergencies, principals generally understood individual design elements of the building and adapted emergency plans appropriately so their schools could be prepared for a crisis. They emphasized close attention to details, such as the importance of keeping doors shut and locked, so that intruders could not have access to the school or students. Finally, principals in older buildings were more likely to discuss inequality in funding for adding safety features. The three principals that did discuss inequality in funding stated that the only way to access funding, sometimes, was through grants.

Table #1 provides a summary of emergent themes and methods by which each theme was achieved from interviews of principals in old buildings, principals in new buildings, and architects.

Table 1

Themes from Three Groups Interviewed

THEME	OLD BUILDINGS	NEW BUILDINGS	ARCHITECTS
Theme #1	**Access control**	**Access control**	**Access Control**
Method(s)	• Security cameras • Buzz-in system • Doors (number, type, and location)	• Vestibules in the front entrance • Buzz-in/check in system • Doors (number, type, and location)	• Hardware changes to door locks • Security desks/security vestibules • Design of front office
Theme #2	**Visibility**	**Visibility**	**Visibility**
Method(s)	• Security cameras • Number of windows • Lighting • Open hallway design	• Security cameras • Number of windows	• Open hallway design
Theme #3	**Preparation**	**Preparation**	**Balance**
Method(s)	• Knowledge of building layout	• Knowledge of policies and procedures	• "Series of Compromises"
Theme #4	n/a	**Movement**	n/a
Method(s)	n/a	• Obstacles to movement (stairwells, building layout)	n/a

Many themes displayed in Table 1 were not directly related to the design of a building. Rather, answers were about general characteristics of safe schools that were either unrelated or indirectly related to the building design. Participant responses that were related to general characteristics of safe schools and unrelated to the building design included: security cameras; buzz-in systems; hardware design of door handle; and knowledge of policies, procedures, and building layout. Participant responses that were specific to the design of a building included the following: number of and location of doors; security vestibules through new or renovated building design; number of and location of windows; presence of natural lighting; open hallway

design; and location and design of stairwells. It was evident, that CPTED principles were either not understood, or relevant to participants. In fact, only one architect even referenced CPTED as a consideration when designing schools.

The number of students receiving free or reduced lunch was identified in each of the ten schools. Only three schools had higher than a 50% rate of free and reduced lunch. Old elementary school #5 had a rate of 70.59%, new elementary school #2 had a rate of 58.21%, and new elementary school #5 had a rate of 50.77%. However, responses of principals from these schools were not distinguished from the other seven schools. School characteristics that influenced perceptions of safety were consistent with overall themes from the study.

Conclusions

The purpose of the study was to identify what physical characteristics of old and new elementary school facilities were perceived by elementary school principals and architects as most significant in impacting school safety. Data revealed consistency in two major topics: access control and visibility. Other themes that emerged from the study included preparation, movement, and balance.

Literature related to the impact of the physical design of a building on school climate and safety is limited. Because of the limited availability of studies on building design and safety, literature was reviewed that analyzed the relationship between the physical design of a school building and student achievement, climate, and safety. Research has generally concluded that the physical environment does have direct and indirect impacts on student learning. Other studies reviewed sought to establish a link between student achievement and the condition of a building by looking at school climate as a mitigating factor. A review of the literature concluded that more research was needed to examine the impact of the physical design of a school and the impact on safety.

The conclusions of the present study were similar to Walton (2011). Walton interviewed principals of high schools built before 1999, principals of high schools built in the previous five years, and architects with experience designing high schools. Walton's study concluded that safety was an important issue to both high school principals and architects. Each of the three groups in Walton's study reported that supervision, technology and cameras, and controlling access to school buildings were important to keeping students safe. Restrooms and locker rooms

were viewed as the two most dangerous parts of a school. Finally, participants in Walton's study were concerned about monitoring a high number of doors and windows in the building. Overall, principals and architects from the study believed that schools were safer in 2011 than they were before 1999. Walton recommended that the study be replicated in elementary and middle schools to "…determine if the themes in the research study are common across the spectrum of public education" (pg. 67).

After reviewing findings, the study can conclude that themes from Walton's study (2011) are similar in the elementary schools that participated in the study. Controlling access to the school building so that individuals could not enter a building without being allowed from the main office was the only consistently common themes of the two studies. Supervision was a common theme of both studies, but participants of the present study were more likely to describe visibility through an open layout of the building that encouraged supervision more so than use of security cameras to supervise. Security and technology were identified by many principals and architects in the present study but were not consistently identified as more important than visibility through an open design. This is, probably, because security and technology have become more prevalent since Walton's study. Participants of the present study were more likely to discuss using open building design to create greater visibility, which enhanced benefits of already existing security cameras and technology.

The present study is an extension of the idea that building design does influence those who use it. If student achievement and school climate are impacted, then building design may also influence safety. Based on data collected from participants, it is evident that elementary schools can be designed or renovated so that those who utilize the building perceive that they are safer. The primary method of design or renovating that will impact perceptions of safety is controlling access into the building. Not only is controlling entry possible, it is very important to principals and architects as they seek to make elementary schools safer. Participants concluded that schools are generally safer today than they were prior to 1999, largely because of the emphasis on access control. The study began with an assumption that the events of Columbine High School had the greatest impact on current school building designs. Principals and architects from the study contradicted that assumption, however, citing the past five years as being a time of most rapid change in building design. One architect specifically mentioned the Sandy Hook Elementary School tragedy on December 14, 2012 as more influential on school

building design than Columbine High School shootings. None of the participants mentioned the events of Columbine High School as having an influence on how they perceived safe school building design.

When designing buildings for safety, it was evident that technology has allowed for greater opportunities to keep schools safe. Technology has accelerated progress in controlling access to and monitoring access of individuals in schools using security cameras and redesigned doors and locks. Decreasing costs of security cameras and other methods of technology has created these opportunities in schools.

Through discussions about controlling access of visitors inside a school building and creating exterior and interior designs that encourage a well-defined flow of traffic and clear lines of sight, the architects generally demonstrated an awareness of issues faced by principals regarding issues that involve keeping schools safe. Restrooms, for example, were identified as the most dangerous location in a school by architect #2. The architect shared that restrooms could be designed to create more visibility from the hallway. By designing restrooms to be more open, students could be seen in all areas except for stalls and urinals.

Most architects perceived bullying to be a concern related to school safety and were aware of the need to minimize experiences of peer victimization. Three architects specifically discussed ways to design elementary schools so that supervision was increased to minimize the impact of bullying. All three believed building designs that encouraged greater supervision would reduce bullying in school. Architect #5, for example, discussed "passive" security designs. Passive security designs were described as areas where supervision would be naturally increased because of the location of high traffic areas. Teacher lounges at the end of a hallway were given as examples of passive security measures since students were likely to be better supervised due to the presence of more teachers. Active security measures are distinguished from passive security measures since they are visible and designed specifically for security. Security cameras, metal detectors, and safety personnel are examples of active security measures (Steinka-Fry, Fisher, & Tanner-Smith, 2016).

Implications for Practitioners

An intended outcome of the study was to identify physical characteristics of old and new elementary school facilities that were perceived by elementary principals and architects as most

significant in keeping schools safe. The findings of the study provide data on determining needs of schools pertaining to safety. The study showed that elementary school principals were aware of the needs of their building and the impact of perceptions of safety on those who utilize it. Principals, therefore, should be involved in the design process since they serve as advocates for the needs of their building. The lack of specific mandates from the Commonwealth of Virginia related to safety affords architects the freedom to work with school divisions on specific school designs. Therefore, more people, especially principals, should be involved in the design process. Patterson, Grenny, McMillan, and Switzler (2012) describe involving others through clarifying conclusions and decisions as inviting them to the "pool of shared meaning" (pg. 178). Principals who are involved in designing schools can state their beliefs on safe building features and can dialogue with architects about how to designs schools for safety in a way that addresses their concerns. Another consequence of the lack of specific guidelines from the Commonwealth is a lack of awareness of crime prevention through environmental design (CPTED) principles among architects. Only one architect mentioned CPTED as a contributing factor in the design process. This is especially noteworthy considering the Code of Virginia specifically states that school divisions should "…incorporate crime prevention through environmental design principles…" (§ 22.1-279.8.).

When considering upgrades to elementary schools, it was clear that principals were concerned about cost. Limited funding is a reality for school divisions as they seek to make schools safer. According to the Virginia General Assembly's website, $1.7 billion in expenditures was proposed from the Commonwealth's general funds for the 2015 and 2016 fiscal years to support public safety. The only amount involving school safety was $750,000, allocated to increase grants to localities so they can place resource and school safety officers in public schools (*Public Safety*, n.d.). Since access to resources is limited, this study provides guidance on what safety features are perceived as having the greatest impact on influencing a safe school, when designing or renovating schools. Based on the results of the study, school divisions and building principals can improve perceptions of safety in school by adding door handles that can be locked from inside and outside classrooms, security cameras to monitor those inside the building, designing vestibules in the front entrance that guide visitors to the main office and prevent them from accessing any other parts of a building, and a buzz-in system that allow

Another consideration when designing and renovating schools is that school divisions should pursue a balance between providing safe but welcoming environments. Principals were more likely to identify aspects of a building seen as visually appealing as in conflict with a safe environment. Architects interviewed believed a balance could be maintained between aesthetics and safety. Schools that are effective in controlling access may not necessarily be perceived as safe if the school building design does not create a welcoming environment. Since school climate is an important component of creating safe schools, administrators should be mindful that aesthetics of a building are important to users because the visual design of a building impacts attitudes of stakeholders, behavior, health, and attendance rates of students (Martorell, Stange, & McFarlin, 2016; Maxwell, 2016; Morris, 2003; Peterson, 2014).

While the physical design of a school is an important variable that impacts safety in schools, it is not the only factor. In fact, the findings of the study did not conclude that it is even the most important factor. The study simply concluded that the physical design of a building is very important to principals and architects. When designing and renovating schools with safety in mind, school officials and architects should be mindful of the limitations to the impact of building design on safety. Architect #4 believed that, while the building design was important in keeping elementary students safe, "…there's really no substitute for eyes in the school and for those teachers and administrators that are there every day that know the kids that know when their behavior is off, that know the parents; there's no substitute for that…Cameras aren't necessarily going to kind of sense when a kid's body language is off and that something's going on." Architect #3 said, "If someone truly wants to get into a school, they're going to find a way to do that. You just want to take whatever measures you can to hinder that." The study confirmed that the human element is still the most important variable in keeping schools safe. Stakeholders, however, can influence actual and perceived safety within a school through their diligence in preparing for emergencies and attention to detail as they pertain to safety.

Recommendations for Further Research

This study was limited to the perspectives of ten elementary school principals. Five elementary school principals came from schools built prior to 1999 and five elementary school principals came from school built since 2011. The study also included five architects with

experience designing elementary schools. To provide further insights into elements of safe school design, the following are recommendations for further research:

1. Walton (2011) recommended that future research return to the site of the study in ten years to determine if emergent themes were still relevant or whether they were due to other circumstances. Similarly, the researcher recommends a return to the research locations of this study in ten years for the same purpose.
2. The present study used 1999 as a pivotal year in school safety, since it greatly impacted how school safety is viewed today. Participants of the study, however, were more likely to reference the events of Sandy Hook Elementary in 2012 as impacting school building design. Future researchers should consider comparing schools designed before and after 2012 to further explore the influence of Sandy Hook on present-day understandings of school safety.
3. Replicate the study to include principals from middle schools to determine if themes from the study are common across elementary, middle, and high schools.
4. Replicate the study to include teachers, students, community members, or school resource officers to determine if themes are common across other demographics who utilize a school building.
5. Expand the study to include a larger population. Create a survey based on findings from the study so that empirical data can be gathered and analyzed.
6. Design studies that seek to further understand the relationship between school climate, including topics such a student victimization and fear, and CPTED principles.

The study concluded that the physical environment of a school is an important component of school safety, according to elementary school principals and architects. Certain design elements can be constructed or added that will influence perceptions of safety among principals in elementary schools. The findings were limited to the perspectives of the individuals involved in the study and not, necessarily, generalizable to larger populations. However, the study provided further data about what building characteristics impact perceptions of safety among those who utilize school buildings.

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APPENDIX A

E-MAIL TO PRINCIPAL REQUESTING PERMISSION TO INTERVIEW

RE: Permission to Conduct Research Study

Dear (Principal),

I am writing to request permission to interview you as a participant in a study. Your superintendent, (superintendent name), has already approved the request to invite you to participate in the study. I am currently enrolled in the Educational Leadership and Policy Studies program at Virginia Polytechnic Institute and State University. I am in the process of writing a dissertation to obtain a Doctorate of Education. The study is entitled *Safe School Building Characteristics in Virginia's Elementary Schools: Architect and Principal Perspectives*.

The study is about physical designs of a school building that architects and elementary school administrators view as safe and unsafe. Schools that were built before 1999 and schools built in the last five years will be included in the study. This is an original research project, based on research literature on school design. You will be asked to participate in an interview consisting of 9 open-ended questions that should take no longer than 60 minutes to complete. No school time will be taken in the completion of the interview. A potential benefit of the study is: The findings of this study will help those persons who design and use schools to understand the physical designs that promote or inhibit a safe elementary school.

Your agreement to allow me to conduct the interview will constitute the following:

- Your identity will be protected. No participant will be identified in the final report. Original data will be destroyed after research is completed.
- In order to protect confidentiality of participants, neither the school nor the school district will be identified in the final report.
- Information gathered during the course of the study will be analyzed and the findings may contribute to published research reports and presentations.
- There are no foreseeable inconveniences or risks involved in participating in the study.
- A copy of the study will be provided to your school division upon completion of this study. The final report will contain a summary of all of the interviews and will not identify specific schools, principals, or school divisions in order to preserve confidentiality.
- There will be no compensation for participants in this study.

If you agree, please reply to this e-mail acknowledging your interest in participating. Once I receive your reply, I will schedule a time to be interviewed. Also, a consent form will be provided a week in advance of the study. Verbal consent will be contained at the beginning of the interview.

Your approval to conduct this interview is greatly appreciated. You may contact me by phone at [redacted] or at my e-mail address: strosper@vt.edu. I would be happy to answer any questions or concerns you may have.

Sincerely,

Shawn Trosper, Researcher
Virginia Polytechnic Institute and State University

APPENDIX B

PRINCIPAL CONSENT FORM

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants
in Research Projects Involving Human Subjects

Title of Project: *Safe School Building Characteristics in Virginia's Elementary Schools: Architect and Principal Perspectives*

Investigator(s):

Shawn Trosper		stroper@vt.edu/[redacted]
Name		E-mail / Phone number
_____		_____
Name		E-mail / Phone number

I. Purpose of this Research Project

The study is about physical designs of a school building that architects and elementary school administrators view as safe and unsafe. Schools that were built before 1999 and schools built in the last five years will be included in the study. This is an original research project, based on research literature on school design.

Overall, three groups of five individuals will be interviewed for the study. Two groups of school principals will be included in the population. One group of principals will consist of elementary school principals from buildings constructed within the last five years. The other group of principals will consist of elementary school principals from buildings constructed prior to the Columbine High School incident in 1999. A group of five architects will be intereviewed for the study. The desired architects will be those who have experience designing elementary schools. Results of the study will be used to write a dissertation to obtain a doctoral degree in Educational Leadership and Policy Studies. Information gathered during the course of the study will be analyzed and the findings may contribute to published research reports and presentations.

II. Procedures

Should you agree to participate, you will be asked to participate in an interview consisting of 9 open-ended questions that should take no longer than 60 minutes to complete. No school time will be taken in the completion of the interview. The interview will take place either at your office, through a telephone conversation, or through face to face contact. Face to face may include video-conferencing formats like Skype or Google Hangout. The interview will be audio recorded.

III. Risks

Due to the small number of people being interviewed, it is possible that your identity could be discerned from quotes or information you provide that is used in the dissertation.

IV. Benefits

No promise or guarantee of benefits has been made to encourage you to participate. A potential benefit of the study for principals, architects, superintendents, school divisions, and policy makers is: The findings of this study will help those persons who design and use schools to understand the physical designs that promote or inhibit a safe elementary school.

V. Extent of Anonymity and Confidentiality

At no time will the researcher release identifiable results of the study to anyone other than individuals working on the project without your written consent. Your identity will be protected as you will not be identified in the final report. Rather, your identity will be coded. For example, participants may be identified as "Principal #1". The identify of participants will be kept on a password protected computer that is separate from data that is coded. Original data will be destroyed after research is completed. Neither your school nor your school district will be identified in the final report. Participation in the study is voluntary and will not affect your performance evaluation. Should you decide to withdraw permission after the study begins, you may notify the researcher of your decision. A copy of the researcher report will be provided to your school division upon completion of this study.

The Virginia Tech (VT) Institutional Review Board (IRB) may view the study's data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research.

VI. Compensation

There will be no compensation for your participation in the study.

VII. Freedom to Withdraw

It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.

Please note that there may be circumstances under which the investigator may determine that a subject should not continue as a subject.

Should you withdraw or otherwise discontinue participation, you will be compensated for the portion of the project completed in accordance with the Compensation section of this document.

VIII. Questions or Concerns

Should you have any questions about this study, you may contact one of the research investigators whose contact information is included at the beginning of this document.

Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991.

IX. Subject's Consent

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date_____
Subject signature

_____
Subject printed name

(Note: each subject must be provided a copy of this form. In addition, the IRB office may stamp its approval on the consent document(s) you submit and return the stamped version to you for use in consenting subjects; therefore, ensure each consent document you submit is ready to be read and signed by subjects.)

APPENDIX C

PRINCIPAL INTERVIEW PROTOCOL

Principal Interview Protocol

Interviewee (Title and Name):

_____

Interviewer:

_____

Introductory Protocol

To facilitate my note-taking, I would like to record our conversation today. For your information, only researchers on the project will be privy to the tapes which will be destroyed after they are transcribed. I have planned this interview to last no longer than one hour. During this time, you will be asked several questions based on information that I would like to discover. If I have a question to clarify an answer, it will be asked during the interview.

You have been selected to speak with me today because you have been identified as someone who has a great deal to share about safety designs that promote or inhibit a safe elementary school. *School design elements* are defined as, "structural elements that can be separately added to or deleted from the design of a school building."

A. Interviewee Background How long have you been ...?

_____ in your present position?

_____ at this school?

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to your buildings now that were not in place prior to 1999?
3. What is the most dangerous place in the school building? Are there ways to design these places to minimize danger?
4. What is the most pressing safety need in your school?
5. What safety activities does your school do best?
6. What are the biggest physical barriers to improve school safety measures?
7. What other factors regarding school design do you believe affect school safety?

8. What role does the physical design play in school safety?
9. What design features have been incorporated to accommodate technological upgrades for safety and security?

Thank you for your time and thoughtful answers today. After reviewing transcripts of these interviews, may I contact you by telephone or e-mail if I have any further questions?

APPENDIX D
COMMON INTERVIEW QUESTIONS

Common Interview Questions

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to buildings now that were not in place prior to 1999?
3. What is the most dangerous place in a school building? Are there ways to design these places to minimize danger?
4. What are the biggest physical barriers to improve school safety measures?
5. What design features in the school have been incorporated to accommodate technological upgrades for safety and security?

APPENDIX E

E-MAIL TO ARCHITECT REQUESTING PERMISSION TO CONDUCT THE INTERVIEW

RE: Permission to Conduct Research Study

Dear (Architect),

I am writing to request permission to interview you as a participant in a study. I am currently enrolled in the Educational Leadership and Policy Studies program at Virginia Polytechnic Institute and State University. I am in the process of writing a dissertation to obtain a Doctorate of Education. The study is entitled *Safe School Building Characteristics in Virginia's Elementary Schools: Architect and Principal Perspectives*.

The study is about physical designs of a school building that elementary school administrators and architects view as safe and unsafe. Schools that were built before 1999 and schools built in the last five years will be included in the study. This is an original research project, based on research literature on school design. You will be asked to participate in an interview consisting of 7 open-ended questions that should take no longer than 60 minutes to complete. A potential benefit of the study is: The findings of this study will help those persons who design and use schools to understand the physical designs that promote or inhibit a safe elementary school.

Your agreement to allow me to conduct the interview will constitute the following:

- The identity of participants will be protected. No architect will be identified in the final report. Original data will be destroyed after research is completed.
- In order to protect confidentiality of participants, neither the school, the school district, nor the architect's firm will be identified in the final report.
- Information gathered during the course of the study will be analyzed and the findings may contribute to published research reports and presentations.
- There are no foreseeable inconveniences or risks involved in participating in the study.
- A copy of the study will be provided to you upon completion of this study.
- There will be no compensation for participants in this study.

Your approval to conduct this interview is greatly appreciated. You may contact me by phone at [redacted] or at my e-mail address: strosper@vt.edu. I would be happy to answer any questions or concerns you may have.

If you agree, please reply to this e-mail acknowledging your interest in participating. Once I receive your reply, I will schedule a time to be interviewed. Also, a consent form will be provided a week in advance of the study. Verbal consent will be contained at the beginning of the interview.

Sincerely,

Shawn Trosper, Researcher
Virginia Polytechnic Institute and State University

cc: Glen Earthman, Dissertation Committee Chair

APPENDIX F

ARCHITECT CONSENT

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants
in Research Projects Involving Human Subjects

Title of Project: *Safe School Building Characteristics in Virginia's Elementary Schools: Architect and Principal Perspectives*

Investigator(s):	Shawn Trosper_	strosper@vt.edu/[redacted]
	Name	E-mail / Phone number
	_____	_____
	Name	E-mail / Phone number

I. Purpose of this Research Project

The study is about physical designs of a school building that architects and elementary school administrators view as safe and unsafe. Schools that were built before 1999 and schools built in the last five years will be included in the study. This is an original research project, based on research literature on school design.

Overall, three groups of five individuals will be interviewed for the study. Two groups of school principals will be included in the population. One group of principals will consist of elementary school principals from buildings constructed within the last five years. The other group of principals will consist of elementary school principals from buildings constructed prior to the Columbine High School incident in 1999. A group of five architects will be intereviewed for the study. The desired architects will be those who have experience designing elementary schools. Results of the study will be used to write a dissertation to obtain a doctoral degree in Educational Leadership and Policy Studies. Information gathered during the course of the study will be analyzed and the findings may contribute to published research reports and presentations.

II. Procedures

Should you agree to participate, you will be asked to participate in an interview consisting of 7 open-ended questions that should take no longer than 60 minutes to complete. The interview will take place either at your office, through a telephone conversation, or through face to face contact. Face to face may include video-conferencing formats like Skype or Google Hangout. The interview will be audio recorded.

III. Risks

Due to the small number of people being interviewed, it is possible that your identity could be discerned from quotes or information you provide that is used in the dissertation.

IV. Benefits

No promise or guarantee of benefits has been made to encourage you to participate. A potential benefit of the study for principals, architects, superintendents, school divisions, and policy makers is: The findings of this study will help those persons who design and use schools to understand the physical designs that promote or inhibit a safe elementary school.

V. Extent of Anonymity and Confidentiality

At no time will the researcher release identifiable results of the study to anyone other than individuals working on the project without your written consent. Your identity will be protected as you will not be identified in the final report. Rather, your identity will be coded. For example, participants may be identified as "Architect #1". The identify of participants will be kept on a password protected computer that is separate from data that is coded. Original data will be destroyed after research is completed. Neither your school nor your school district will be identified in the final report. Participation in the study is voluntary and will not affect your performance evaluation. Should you decide to withdraw permission after the study begins, you may notify the researcher of your decision. A copy of the researcher report will be provided to your school division upon completion of this study.

The Virginia Tech (VT) Institutional Review Board (IRB) may view the study's data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research.

VI. Compensation

There will be no compensation for your participation in the study.

VII. Freedom to Withdraw

It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.

Please note that there may be circumstances under which the investigator may determine that a subject should not continue as a subject.

Should you withdraw or otherwise discontinue participation, you will be compensated for the portion of the project completed in accordance with the Compensation section of this document.

VIII. Questions or Concerns

Should you have any questions about this study, you may contact one of the research investigators whose contact information is included at the beginning of this document.

Should you have any questions or concerns about the study's conduct or your rights as a research

subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991.

IX. Subject's Consent

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date_____
Subject signature

_____
Subject printed name

(Note: each subject must be provided a copy of this form. In addition, the IRB office may stamp its approval on the consent document(s) you submit and return the stamped version to you for use in consenting subjects; therefore, ensure each consent document you submit is ready to be read and signed by subjects.)

APPENDIX G

ARCHITECT INTERVIEW PROTOCOL

Architect Interview Protocol

Interviewee (Title and Name):

_____

Interviewer:

_____

Introductory Protocol

To facilitate my note-taking, I would like to audio tape our conversation today. Please sign the release form. For your information, only researchers on the project will be privy to the tapes which will be destroyed after they are transcribed. I have planned this interview to last no longer than one hour. During this time, you will be asked several questions based on information that I would like to discover.

You have been selected to speak with me today because you have been identified as someone who has a great deal to share about safety designs that promote or inhibit a safe elementary school.

B. Interviewee Background

_____How many schools have you designed?

1. Specifically, what is the most important design element, component, or feature in the school building to make the school safe?
2. Have there been additional design elements added to buildings now that were not in place prior to 1999?
3. What is the most dangerous place in a school building? Are there ways to design these places to minimize danger?
4. What are the biggest physical barriers to improve school safety measures?
5. What design features in the school have been incorporated to accommodate technological upgrades for safety and security?
6. Has the federal government or state mandated any added or different safety designs since 1999 that must be incorporated in schools?

7. Do you think that schools designed after 1999 are generally safer than those designed before that date? If so, in what ways?

APPENDIX H

VIRGINIA TECH INSTITUTIONAL RESEARCH BOARD APPROVAL LETTER

VirginiaTech

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE:	November 28, 2016
TO:	Glen I Earthman, Shawn T Trosper
FROM:	Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE:	Safe School Building Design in Virginia’s Elementary Schools: Architect and Principal Perspectives
IRB NUMBER:	**16-1058**

Effective November 28, 2016, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Expedited, under 45 CFR 46.110 category(ies) 5,6,7**
Protocol Approval Date:	**November 28, 2016**
Protocol Expiration Date:	**November 27, 2017**
Continuing Review Due Date*:	**November 13, 2017**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.