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EVALUATING LOCKERLESS SCHOOLS

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EVALUATING LOCKERLESS SCHOOLS

by

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TREATISE

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DEDICATION

to all my teachers and especially Dana, forever

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EVALUATING LOCKERLESS SCHOOLS

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For a decade secondary school administrators have been actively implementing the lockerless school facility adaptation. Due to this new concept, school administrators around the state have removed lockers from the academic environment as a facility construction and renovation adaptation. The purpose of this study will be to evaluate the effectiveness of lockerless schools that have successfully implemented this procedure. This study will investigate if changing to a lockerless school can effectively improve school's safety/security, learning environment and cost efficiency.

Lockerless schools will be compared to traditional schools with lockers in order to determine their differences in school security, learning environment, and cost efficiency. Learning environment and security data will be gathered from a faculty survey conducted in lockerless schools across the state. Survey criterion statement ratings will receive

description from the comment section of the study. Cost efficiency will be calculated by comparing related cost's such as maintenance, books, construction, and renovation of a campus with lockers to one without lockers.

The rapid growth of Texas' school population has spawned a boom in school construction and renovation. School administrators will be able to use information from this study to determine if lockers are necessary technology when building their 21st century schools. The results of this study will add knowledge to the debate on the merits of lockerless schools.

The study's survey resulted in findings that merit attention, and support previous research that points to a connection between school facilities and a secure, productive learning environment. The cost efficiency comparisons for school construction and renovation without lockers show significant cost savings and life-cycle benefits. The findings were limited due to the volunteer nature of the survey, the limited number of responses from certain schools, and the aggregate nature of the data that can obscure or neglect important evidence. Nevertheless, the goal of school architects and administrators is to build a cost efficient campus that is safe, secure, and aids the learning environment.

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EVALUATING LOCKERLESS SCHOOLS

CHAPTER I

Introduction

Public schools are expected to provide a safe, secure, and positive learning environment in a cost efficient manner. School security and discipline issues today are at the forefront of general school environmental concerns. School building codes and policies address safety concerns with fire drills, vandalism prevention, and adequate utilities. Today, these measures must all be met along with student violence, weapons, drugs, and surveillance issues. These current security issues give school designers and administrators a totally new definition of the term “safe schools”. School shootings in Columbine and Jonesboro have brought national attention to the safety of students in U.S. public schools and a new movement is emerging, that of lockerless schools. “There are safety issues in both the no-locker and no-backpacks movement. Post-Columbine, schools are vigilant about eliminating any possible hiding places for guns, knives, drugs or other contraband. In places that have adopted either measure, kids learn to carry less stuff” (Benton, 2002, p1).

A clean and quiet learning climate is a requirement for an environment conducive to learning, according to national school planning standards. “Facilities must be designed to prevent loud noise from traveling from one section of the building to another” (Pauley V. Bailey, 1982). Adequacy and efficiency are extremely important in creating a proper learning climate. “Efficiency is often interpreted only as an expenditure issue, but also refers to the facilities themselves. Well planned programs are enhanced by facilities

which optimize their delivery” (CEFPI, 1991, p. D23). When considering campus cleanliness, acoustics, safety, security and efficiency, secondary school lockers can detract from the desired learning environment. Supporters of lockerless schools claim their schools are quieter, cleaner, safer and promote better academic organization than when students used lockers. “Birdville High is a poster child for a movement to eliminate lockers from junior highs and high schools in Texas. Locker opponents say they are a threat to safety, encourage immature behavior, and give too many excuses to students looking to slack off” (Benton, 2002, p1). Lockerless schools administrators profess that lockers are not appropriate for promoting post secondary education. “They’re not going to have lockers when they go off to college, so they might as well learn how to be organized and responsible now, said Dr. Debbie Tribble, who has been principal at Birdville High since it opened three years ago”(Benton, 2002, p1). Many large secondary schools have corridors lined with lockers, often not used and often broken or vandalized. The hallway atmosphere can actually inhibit student behavior by creating a hectic, chaotic, and congested corridor environment. “When humanely designed, schools educational environments increase perception of ownership and pride, which reduces vandalism and abuse maintenance cost, in addition to operation and construction dollars” (CEFPI, 1991, p. D23). Jim Chadwell, principal at Northwest High School, which eliminated its lockers in a recent renovation project, said “Maintaining them takes an enormous effort. You want an image of a clean, safe, orderly facility, and a key being dragged across 25 lockers can make that hard” (Benton, 2002, p1).

Cost efficiency must be a primary concern when planning any school. Dr. Tribble said, “Designing our school without lockers saved about \$250,000 during construction. A full-length locker can cost \$150 to \$200, and maintenance isn’t cheap. Going lockerless allows architects to save thousands of square feet in their floor plans. That can cut back on construction cost or allow other extras to be included in the building” (Benton, 2002, p8). The absence or presence of a facility adaptation such as lockers will have a complex effect on total school climate.

Since lockerless schools are non-traditional, they require renovations or new construction. According to the Council of Educational Facility Planners, there are three topics of school environment to consider during renovation or construction: physical, social, and instructional. “None of the three exist in a vacuum, and each is dependent on the other two” (CEFPI, 1991, p 113). Concerning the social aspect of environment, school administrators claim that students waste time lounging around their lockers between classes which can spawn discipline problems, particularly on already crowded campuses. “We had many more fights when we had lockers, said Jim Yakubovsky, principal of DeSoto High School’s freshman campus, which is in its second year without lockers. Now they just go straight to class” (Benton, 2002, p8).

In public education, considerable emphasis is placed on measurable results when evaluating programs and policies. These results should drive the physical, social, and pedagogical structures of our schools.

The work of Robert Baker led to analysis of “behavior setting” as an aspect of environment. The acceptance of the premise that environment does affect

behavior presents a fundamental ingredient for environmental design. If the type of designed behavior (learning) is known and the physical environment which will cause or contribute to that behavior can be determined, a behavior setting is identified. An example of this was recently noted by the writer. School corridors are typically noisy areas of the building. The behavior desired is a decrease of boisterousness by the students. (CEFPI, 1991, p. I14)

This study will evaluate lockerless schools to determine if the previously mentioned benefits in safety, security, learning environment and cost efficiency exist in a varied sample of lockerless schools.

Statement of the Problem

When applying the premise of behavioral settings to locker lined corridors, many secondary school administrators have decided to implement the lockerless school policy. Recently school administrators across the state have removed lockers from the academic environment as a facility construction and renovation adaptation when considering the issues of school security, learning environment, and cost efficiency. The purpose of this study will be to evaluate the effectiveness of lockerless schools that have successfully implemented this procedure. This study will investigate if changing to a lockerless school can effectively improve school safety/security, learning environment, and cost efficiency. “Any change made in the physical environment should enable people to relate to each other, to objects of study, to furniture and equipment, and to the space inside itself in a way that will promote the goal of the educational program” (CEFPI, 1991, p.N3). This

study will also broaden the knowledge of the researcher and the readers concerning lockerless schools.

Lockerless school proponents claim recognizable improvements in school security. Campus administrators consider lockers as a primary source of problems that detract from the desired behavioral setting in secondary schools. They connect lockers to contraband such as drugs, weapons, and pornography. According to school administrators, lockers foster discipline problems such as theft, student violence and tardies. Administrators in lockerless schools consider lockers a secondary school design concept of the past with little conceivable, beneficial use in the future. They see the future space for academic storage and organization as electronic, in the form of laptops, which many schools have provided to their secondary students. School architects have embraced the lockerless concept because it encourages building schools for future learning specifications and not past applications. Air conditioning, school nutrition programs, and personal computers have rendered lockers obsolete as storage for jackets, sack lunches, and textbooks.

School environment is a main concern when evaluating effective schools. The school climate must be clean, quiet, and pleasing in nature. Lockers have proven to hinder school official's attempts to maintain a desired behavioral setting. Many school administrators state that lockers only have a negative effect on the school atmosphere. All schools have by structure, physical environments which create psychological climates, and both combine to form the learning atmosphere for all the school stakeholders. Students and teachers cannot be productive in a messy, noisy, ugly school

atmosphere. Research on acoustics firmly supports that noise levels must be low to achieve a quality school climate. “Sound is a negative influence when it hinders verbal communication and creates a need for talking loudly. Such competition may produce tension and fatigue” (CEFPI, 1991, p. 112). Traditional schools with lockers are jungles of noise, requiring students and staff to compete to be heard resulting in anxiety and frustrations. It takes the first 10 minutes of class to calm students down after fighting their way through locker corridors to get to class. This obviously results in loss of learning time. Many students have complicated this problem by not using their locker and carrying all their supplies and books in a backpack. This has resulted in a potential back injury health concern issued by the American Occupational Therapy Association. Brynda Pappos of the American Occupational Therapy Association says “lockerless schools make sense” (Colgan, 2002, p. 8). Lockerless schools require students to have a book at home and access to a class set at school; therefore, eliminating heavy backpacks and potential back injury. Lockerless secondary schools put all the tools of education in the right places to maximize learning efficiency. Books are kept at home to aid in homework completion. Classroom textbook sets are available for daily teaching tools and library texts are available for before and after school use. Students are taught how to academically organize personal multi-subject notebooks and class portfolios. Each child is given a day planner for the school year and teachers publish a class syllabus to help students understand class time frames and requirements. Teachers witness a reduction in interruptions during class from hall noise or student requests to leave class for something

they left in their locker. All these practices combine to create the desire behavioral setting.

In schools today, lockers line halls or sit in bays detracting from the smooth flow of pedestrian traffic to and from classes. They represent a maze of metal traps that have to be maneuvered by students and staff on an hourly basis. Over time, lockers become broken down and dilapidated, thus, compounding the problems of student egress.

Schools with high student achievement are designed with behavioral settings that foster academic improvement. Too often, not enough attention is put in to the furnishings of a school. Usually the prevailing attitude is: "If tables and chairs can hold people, paper or materials related to instruction, they are considered adequate. This limited reasoning gives little or no attention to the proposition that furniture and equipment play an indispensable part in providing a creative environment for learning" (CEFPI, 1991, p. J2). Consequently, lockers are considered to be adequate school equipment and are rarely evaluated for an academic purpose. A recent article published in *American Schools and Universities* commented about school locker choices. "These storage spaces are so prevalent in schools that it is tempting to consider them as afterthought in planning a school. But the type and size of lockers and where they are placed can have a significant effect on the school environment. In a few cases, administrators longing to rid their facilities of the noise that lockers create and the security problems they pose, have opted to do away with them altogether" (Kennedy, 2000, p. 23-25).

Purpose of the Study

The researcher will seek to assess whether the absence of lockers as part of the behavioral setting improves safety/security, learning environment, and is cost efficient. State and Federal building requirements as well as current publications regarding safety and security will be thoroughly researched. Previous studies of the effect school facilities have on the learning environment will be reviewed. Lockerless schools will be evaluated on their success in contributing to the desired behavioral setting in a cost efficient manner when compared to traditional schools with lockers.

Many efforts have been made to improve our school facilities since the 19th century classroom models of the Lancaster System and the Quincy Box. Often these changes are government requirements which regulate the classroom size according to student age and curriculum. These codes are based on occupancy relationship to safety. Consequently, classroom regulations are closely related to city, state, and federal public facility building codes. These codes were established for the safety of workers and are regulated by city, state, and federal agencies. Recently, operating cost efficiency has become a concern of government due to pollution and rising energy cost. Therefore, building codes have been established to protect the environment and conserve energy.

The school building must be evaluated in three primary areas which affect all buildings as they age: cost efficiency, security, and learning environment. These three factors have always been the primary reason for renovation or new construction of any school. The history of school buildings orients around providing an effective school that has all the aspects involved in building codes of the current day; such as the Americans

with Disabilities Act (ADA) requirements, fire codes, health codes, air quality codes, utility codes, and others. These requirements are conceptual at a national level and are presented as guidelines for school construction as represented in the *Guide for Planning Education Facilities* manual produced by the Council of Educational Facility Planners. The state of Texas is charged with the responsibility of enforcing the minimum school facility standards as represented in Chapter 61 of the Texas Education Code produced by the Texas Legislature and enforced by the Texas Education Agency, Facility Division (2003). Locally each school district adapts the state requirements into local board policy. Additions to these policies can be made according to local standards. Some communities have building codes and standards which are highly restrictive as to where a school should be built for the purpose of improving cost efficiency, security, and learning environment.

Designing a school without lockers is a local policy option, which relates to aspects of school cost efficiency, security, and learning environment. The policy is not a requirement in Chapter 61 of the state facility minimum standards or a recommendation from the Council of Education Facility Planners. The policy originated from a grassroots movement of school administrators who wanted to improve their secondary school behavioral setting. Their efforts have spread this policy by word of mouth and periodical articles. “Lockers have traditionally been a part of Texas schools. The Texas Education Agency doesn’t keep track of how many schools make do without lockers, but Mr. Bartosh, an expert on lockerless schools, said there are about 60 schools without them, and nearly all of those have gone lockerless in the last two or three years” (Benton, 2002,

p8). The policy is simple: Get rid of your lockers; Put all supplies, books, pens, where they belong (in the classroom or at home); and teach students to academically organize as if they were in college with day planners, notebooks, and portfolios. This policy promotes a post secondary academic atmosphere similar to college setting and not the labor atmosphere exemplified by our assembly line, factory based schools built in the past. M. Dudley, an architect with Pfluger Associates states: “Post WWII schools became more industrialized and education settled into an almost ‘factory-like’ learning mentality” (Dudley, 2003, p. 1).

Educational researchers such as Eric Jensen have aided architects in the designing of schools by relating safety, security, ergonomics, climate control, lighting, color, peripheral stimuli, noise, aromas, air quality, and location to quality learning environments. Jensen concludes that a well planned school facility will biologically stimulate a student to learn. “When orchestrated with other sound teaching strategies, brain-friendly learning environments strengthen neural connections and aid long-term memory, planning, and motivation, note researchers Frank and Greenberg” (Frank, 1994, p.5)

The purpose of this study will be to compare the new contribution of lockerless schools to a behavioral setting that is a safe, secure, conducive to learning, and cost efficient. This knowledge will help school administrators adopt policies that enhance and enrich their school’s learning environment. This study is based on the principle that a single pro-active change in the learning environment will eliminate the need for establishing reactive policies which can reduce the sustainability of the school building.

“At school only the quality of the teacher is a greater determinant of student success than the environment. One environment brings out the best in us and another brings out the worst in us. They can be nourishing or toxic, supportive or draining. Environments are never neutral” (Jensen,2003, p.V).

Research Questions

1. Are lockerless schools more cost efficient than traditional schools with lockers?
2. Do lockerless schools improve school security as opposed to traditional schools?
3. Do lockerless schools create a positive change in the learning environment as opposed to traditional schools?

Hypothesis

1. Lockerless schools will show initial savings in new construction, and long term cost efficiency in maintenance, operations, renovation and text book replacement as opposed to building and operating a school with lockers.
2. Lockerless schools will be perceived as more secure and safer than a secondary school with lockers.
3. Lockerless schools will be perceived as having a more positive learning environment than schools with lockers.

Significance of the Study

As educators, when considering our learning spaces, we normally are concerned with the classroom. It is true that a secondary student will spend the majority of his/her eight hour school day in the classroom. Typically students will spend six hours a day in a

conventional classroom and the other two hours will be spent at lunch, in a hallway, outside, or in some other transitional part of the school facility. The locker lined hallway is the transitional part of a school facility that this study is concerned with. For over fifty years, secondary school halls have been lined with hundreds of lockers. This study will question if lockers continue to enrich the learning environment of our students.

In today's schools, lockers possibly serve more to hinder the school environment because of the problems they present with regard to security, noise, and maintenance costs. For at least one hour each day, our secondary school students engage each other in a hostile, unsafe, and stressful exercise known as "the passing period". During this time, students attempt to get from their locker to their next class in five minutes or less. They will conduct this exercise nine to ten times daily under duress of the dreaded tardy bell. Consequently, almost an hour of every educational day is spent in disorganized chaos.

This passing period experience is totally contrary to the research conducted on enriched learning environments and social contact in the work place. This research suggests there is an interactive aspect of the learning environment that predetermines the opportunity to learn. Eric Jenson in his book "Environments for Learning" states: "Maximum attention ought to be given to creating an encouraging, interesting, and safe environment. In such a setting, students unconsciously begin to acquire a foundation for understanding before they even know they know something; in fact, even before the teacher enters the room" (Jensen, 2003, p IX).

School administrators need not allow the antiquated facility practices of our past to hinder our learning environment. Currently, schools are attempting to convert to a

paperless environment with the implementation of student lap-top computers, e-mail, internet, books on C.D.'s, palm pilots, wireless networks, and pin or zip drives. "Schools need to learn to use these technologies to enhance educational experiences, not ignore or ban them. This generation will not be willing to leave their virtual lives at the school door" (Johnson, 2004, p8). In the same regard, the prudent school administrator will seek to eliminate the useless technologies of the past. Lockers would not appear to fit today's age of electronic information delivery. The locker was designed to fit the Scientific Management gospel of Fredrich Taylor (1856 – 1916) who believed in control by rules. Today, our students can carry all their educational tools in a lap-top computer and a backpack. Ian Jukes, author of *Windows on the Future: Education in the age of Technology* states, "Education is poised between the past and the future, the industrial and technology, the failures and the unknown. Educators are being challenged to reinvent, redesign, and reshape the learning experience" (Jukes, 2000). The lockerless school movement could aid in preparing school facilities for the future when a student laptop will cost less than the combined cost of purchasing, installing, and maintaining a school locker, when safe schools are built with individual security as a priority instead of a sacrifice for the good of the masses, and when school designers consider the total learning environment on both sides of the classroom wall.

Definitions

1. A.E.I.S. – Academic Excellence Indicator System for Texas public schools.
2. C.E.F.P.I. – Council of Educational Facility Planners International. This group of school designees publish guidelines for school facilities.

3. Chapter 61 – The chapter in the Texas Education Code that sets the minimum school facility standards.
4. E-Locker – electronic method for storage and transmission of information by students made possible by computer technology.
5. Efficiency – is the economic expenditure and use of a facility.
6. Lancostrain System – a classroom designed in England in the 19th century to accommodate one student per 10 square feet. This 5000 square foot room could seat 500 students.
7. P.E.I.M.S. – Public Education Information Management System for Texas public schools.
8. Quincy Box – a classroom designed in the U.S. during the industrial revolution. This 806 sq. ft. room accommodated 55 students allowing 14 ½ sq. ft. per pupil.
9. Sustainability – the ability of a school building to withstand the test of time.
10. TEA- The Texas Education Agency
11. W.A.D.A- Weighted Average Daily Attendance is how the Texas school finance system accounts for funding schools on a daily basis by student attendance.

Researcher History

The researcher has first hand knowledge in converting to and operating in a lockerless school. In the 1998-1999 school year as principal of Granger Secondary School, I took a lead role in converting the 6-12th grade campus into a lockerless

environment. This process started due to a facility renovation need. The lockers in our academic halls were in need of replacement due to many years of use. Repair was not an option because these locker units were well over twenty years old and had been painted and repaired in the past. The lockers were removed in June and placed in the parking lot awaiting my attention while I was attending the Secondary School Principals Conference in Austin, TX. At this conference I attended a session on implementing the lockerless schools procedure at Patty Welder Middle School in Victoria, TX presented by the principal Eloy Chapa. He explained the implementation process and elaborated on the security and learning environment benefits witnessed after one year in operation. The timing was perfect for Granger secondary school, because our lockers were already removed. After attending this lockerless lecture, it appeared we didn't need to put new lockers back.

The superintendent and school board of Granger ISD were both intrigued by the possibilities of a secondary school without lockers. They understood there was money to be saved by not buying new lockers, and the school would possibly be safer, quieter, and cleaner. The policy was approved and implemented for the 1998-1999 school year. Based on that decision, in July of 1998, I have gathered eight years of experience in lockerless school operations at Granger. After our first year of operation we witnessed impressive changes in improved security and learning climate. Due to these results I felt compelled to tell our story of changing to a lockerless school. Consequently, I have conducted lectures on the benefits of lockerless schools to teachers, administrators, board members, school architects, and state education officials. Due to these lecture sessions,

many secondary schools have renovated or newly constructed without lockers. Annually I am contacted by newspaper journalists, school administrators, and architects across the state and nation for information regarding lockerless schools. Over the past eight years, I have acquired a reputation as an expert on lockerless schools.

Continued interest in the lockerless policy and practice by school administrators and architects is my inspiration for this study. Empirical data needs to be gathered on the lockerless school movement to accurately determine its effect on secondary schools. This study will begin the needed research.

Researcher Bias

A natural bias exists due to the researcher's extensive promotion of the lockerless school concept. This bias toward the benefits of lockerless schools is based on eight years of experience working in Granger ISD's school without student lockers and discussing the concept with other educators who also share this same experience on other campuses. The researcher has never received any monetary compensation for promotion of lockerless schools nor have any outside funds been furnished to influence this study. The lockerless school concept was implemented by the researcher in order to save money during a renovation project and to improve the academic environment in regard to security and learning spaces. Granger ISD experienced benefits in these learning spaces. Through discussions and testimony about the lockerless concept the researcher has found that other schools across the state have experienced these same benefits. Currently this information is only documented by the testimony of educators who have been interviewed for articles written on the highly controversial topic of lockerless schools.

This study will seek information from teachers and administrators in lockerless schools across Texas in order to determine if the researcher's bias toward lockerless schools is shared by all who experience the concept. The data gathered in the study will determine what is fact and what is fiction regarding lockerless schools.

Benefits of the Study

The lockerless concept has generated new ideas for the construction and renovation of secondary schools. This new paradigm of a secondary school environment has been slow to catch on, but that is true of most transitions in their early stages. The purpose of changing schools is to enhance learning. "Any changes made in the physical environment should enable people to relate to each other, to objects of study, to furniture and equipment, and to the space itself in a way that will promote the goal of the educational program" (CEFPI, 1991, p. N3).

This study will provide educators perceptual data of the effectiveness of lockerless schools. This perceptual data will add to the knowledge base regarding school security, learning climate, and cost efficiency. A systematic change promoted by the lockerless school environment could improve the behavioral setting. "Systematic change means doing different things (rather than doing the same thing differently) by developing new practices, relationships or roles" (CEFPI, 2004, p. 1-3). These environmental changes combine to create a new learning climate, which spawns a successful school atmosphere and promotes individual student achievement.

Conclusion

Changing to a lockerless school appears to fit the preferred technologies of today's students. Too often new technologies are resisted by the status quo, (teachers and parents) who have their comfort zone in tradition. School policy change should result in student achievement, cleaner and quieter learning environment, less violence, and reduced contraband and theft, which can be evaluated in a time span that is relative to specific cost efficiencies. Cahill and Overmann explain that national models of policy evaluation are "most often validated by the use of quasi-experimental designs of social research that compare change in condition of behavior before and after a change in program of policy" (1990, p. 14). In a national choice model, the results of the new policy should be predictable. Cooper states that "policy evaluations is the attempt to predict the results of a new policy on the learning of children or the efficiency of school districts" (Cooper, 2004, p. 113). Can the lockerless policy have predictable and practical qualities in the school's daily operations? Cooper also states that national policies in school must bring the teacher into the equation. "Although research scientist seek universal, rigorous, predictive (if X, then Y), significant findings and knowledge, teachers want practical, particular, narrative understanding based on real life experience" (Cooper, 2004, p. 113). Does the lockerless policy encourage a real life model of academic organization that is difficult to prove with the scientific method? Are lockerless qualities subliminal in the change process, thus making the benefits of lockerless schools hard to measure but easy to witness?

A facility shift to lockerless schools could be a match for times of growing enrollment and declining funds. Due to current enrollment growth and aging facilities the timing is perfect for a major facility initiative like lockerless schools. “In the year 2000, public school districts in the US spent \$21.2 billion on school construction and renovation, making the end of a decade in which capitol expenditures grew by nearly 40 percent” (U.S. Gen. Acc. Office, 2000). These renovations and new construction projects should consider how technology has affected education today with electronic books, distance learning, personal computers and lap tops, electronic storage, internet access and electronic libraries, and programmed instruction. Our educational technologies today have advanced beyond the audio visual requirements of the 20th century. Administrators have to make their existing facilities fit these new age demands. Today, academic technology application requires personal computers. Many schools have chosen to provide each student with a lap-top computer. These concepts question the need for a locker, when organization can be streamlined with a backpack and a P.C. or Palm Pilot. Why carry a five-pound textbook when a one-ounce C.D. will do? Why shuffle and transport paper when e-mail and disks can carry the work electronically? Could lockers possibly have lost their academic application?

Administrators should get involved in building facilities so their schools will reflect the new age of learning. The time spent in building a better school will pay ten fold in instructional value in the future. “School facility design has garnered much attention these days. With an increased interest in student performance as well as safety, the old brick and mortar, cheapest is the best notion is dead and buried. Innovated school

design no longer refers merely to creating facilities that have a splashy, interesting exterior. Today it means that schools are socially smart, cognitively supportive, emotionally safe, and environmentally friendly” (Jensen, 2003, p.43).

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

“In the year 2000, public school districts in the United States spent \$21.2 billion on school construction and renovation, marking the end of a decade in which capital expenditures grew by nearly 40 percent. This spending pattern reflects a variety of influences, including aging facilities, increasing enrollments, and a strong economy” (U.S. Gen. Acc. Office, 2000). Many schools are not equipped to meet the educational demands of the 21st century such as pre-kindergarten, internet access, and promising instructional technologies. For these reasons educators and school architects need to search for cost efficient, safe, and researched building practices that will improve our children’s learning environment. Our new and renovated buildings need not include useless technologies, which are relics of our past educational processes. The blackboard has been replaced by electronic projection devices. All of the student’s text books for a year of school can be digitally recorded on a single CD. Individual student school work can be stored and turned in electronically via the internet by using a personal lap-top computer, thus eliminating the need for an individual student locker. Eliminating the antiquated technologies such as a student locker will help provide funds for the new technologies required in a 21st century school.

In chapter II, relevant literature linking the facility adaptation of lockerless schools to cost efficiency, security, and learning environment will be reviewed. Specific studies, advocacy papers, manuals, speeches, and reports will be examined to determine the

extent to which a lockerless facility should promote better cost efficiency, tighter security, and improved learning climate. Related topics of Texas school finance, National school facility history, and effects of facilities on student productivity will be studied. The chapter will conclude with information regarding the effect school facilities have on a big picture variable on student productivity.

Historical Perspective

Any historical discussion on education always orients around the facility in which the education took place. Historical school buildings and floor plans tell us a lot about the way children were taught and the emphasis placed on education by society at that time. The history of education in the U.S. is often characterized by the picture of a one room school house which depicts the rural roots of our country and creates a visual image of the school buildings' historical significance. Today, pictures of schools are embossed on diplomas and on graduation announcements. This practice reinforces the building's significance to present day education. Texas' greatest institution of higher learning uses the symbol of a historical antiquated library to represent the University of Texas over its motto "We are Texas". This old library symbolizes the importance of knowledge and learning, just as libraries have for centuries around the world. We can only imagine what the great library in Alexandria, Egypt must have looked like before its destruction. The U.T. library was built to symbolize a lighthouse, for the illumination of knowledge. Our schools represent the past endeavors of education, and they stand as symbols in every community of the United States as a physical reminder of our commitment to education. The buzz words in education today are "all children can learn". This statement blends

well with our 230 year old Bill of Rights that declares that “all men are created equal”. Public education is the great equalizer and our institutions of public learning will always stand for freedom and equality in the U.S. The challenge today rests in the hands of educators and architects to work hand in hand to assure that the buildings we build will serve our students needs today and in the future. Today, this challenge (as never before) is more critical because of the growing enrollment demands on our education facilities.

In the mid 1980s, the decline in education bottomed out. From a low of 44.9 million in 1984, the numbers have climbed every year since. In 1997, it reached 51.7 million, surpassing the high of the baby-boom years, and is expected to top out in 2005 at nearly 53.9 million. School districts have to face a double whammy in finding facilities to address the resurgence in student population, and coping with facilities built in the previous boom years that were aging not so gracefully. (Kennedy, 2003, P. 32)

Building Importance

It is impossible that every child will go to school in a new building with all the modern conveniences and technology of the 21st century. Most of our buildings are mid-20th century structures and many of the facilities in use today were built at the turn of the 19th century. Most of us take great pride in these older buildings; but will these aging buildings (like the U.T tower, which is now used for office space) be more than just a symbol of our commitment to education? The truest test of a building is its ability to integrate today’s technologies with the past, to produce a quality learning environment. At the turn of the century, educational leaders broke the mold of the one-room school

house to create effective institutions of public learning for the age of the industrial revolution.

Rugg and Scumacher (1928) reiterated the importance of change that took place in educational theory around the turn of the century. The inadequacy of traditional schools with its formal regimented instruction was becoming more evident to educators throughout the century. John Dewey (1899), in characterizing turn of the century instructional methodology, referred to the ‘sitting and listening’ school. As the emphasis upon particular needs of growing children continued to expand the necessity for functionality of design in school house architecture become apparent. This gradual transition in theory gave rise to a movement that considered schools as a place where children could ‘live as children’ rather than a place where the total objective was on preparation for adult life. (Otto, 1944, CEFPI, P. A5)

A statement published in the very first issue of *American Schools and Universities*, in 1928, rings true today: “The nationwide problem of inadequate school buildings that don’t meet modern standards... The benefits of smaller class sizes for students and teachers... The use of staggered schedules to help alleviate space problems in crowded facilities... The wisdom of thoughtful planning to anticipate future school facility needs” (Kennedy, 2003, P. 21). A look at our past two centuries of school buildings will help us determine current policy for the building of better public education facilities to suit our technologically oriented future and not our labor oriented past.

Schools today are built to support the attainment of academic integration rather than the robotic patterns and rote memory of our industrial past.

First Schools

During the colonial period of our nation, education was considered to be the responsibility of the church. “Consequently, church buildings served to accommodate educational activities as well as religious functions” (CEFPI, 1991, p. A2). Churches are designed for preaching and lecturing where all can hear and see the preacher/teacher. This could be in a ratio of hundreds to one. “As time proceeded and communities expanded, the one-room school house became the most common means of housing educational programs” (CEFPI, 1991, p. A2). These structures were virtually smaller versions of the church and very crude in structure due to lack of financial support for education. Time spent in these one-room schools was limited by the primitive nature of the building and furnishings. Schools kept pace with society as it grew and changed in the United States. But the structures remained very limiting, focused totally on economy of space just like churches still are today.

The Lancostrian school system was designed in England and adopted in the U.S. in the early 19th Century. “The classroom facility was constructed to house the system which was designed to accommodate great numbers of students of every grade and achievement level. It was not unusual in early schools to have 500 seated in a single 50-foot by 100-foot room. The use of benches rather than desk allowed the room to accommodate one student for each 10 square feet of space” (EFL, 1960, A2). Obviously, in this era, education was designed to be a short-term social process on a limited time

schedule. Once again, just like the church model of “get it and go”, no interaction was necessary; the school was strictly designed for the delivery of the message.

Early Reform

In the mid 19th century school reformers like Henry Bernard and Horace Mann professed that schools should be more than shelters. “These early reformers shared the point of view that it was important to ask children what they learned at school: however it was more important to ask them what they learned from the school house” (CEFPI, 1991, p. A3). This is a question relevant to today. What are our schools teaching our children? Our curriculum of Academics, Physical Education, Arts, and Vocation is commonly accepted as a well-rounded message for self-improvement. But what are we learning about social interaction from our school structures which are the very essence of our society. Early schools of the U.S. worked within the confines of the current ideology of the industrial revolution. The Quincy Box was designed like most factories of its day. These classrooms were designed for maximum efficiency of the work force, the students, and economy of special relations; 55 students to 806 square feet. This is 14 ½ square feet per child, and considerably larger than 10 square feet per child required in the Lancostrian system. “The instructional methodology of this time, which required pupils to sit and listen to the teacher, and on occasion stand beside their desk and recite was well served by this arrangement” (CEFPI, 1991, p. A5). Many of these classrooms are still in use today. These schools were built in the 20s and 30s to Quincy Box specifications with a classroom floor-plan of 31 feet by 26 feet. Of course today we can only put 25 to 30

students in a classroom of this size. Safety regulations specify the square footage per student.

In 1924 the Granger Texas school structure was built to house all grades, primary through secondary. The structure was a common design whose floor plan was copied twice for public schools in neighboring school districts; Taylor, to the south in 1930, and Georgetown, to the west in 1928. The façade of the Granger structure is Spanish Colonial and Neo-Colonial in Taylor and Georgetown. The floor plan of all three buildings is one used all over the nation by school architects of this era. Interestingly enough, all three buildings are still public schools today. The Granger building is a secondary school. The Taylor structure is a junior college campus, and the Georgetown building is an elementary school. These buildings prove that schools must be built to adapt to future educational needs and specifications. The model of the Quincy Box (806 square feet per class room) is still the basic standard of the industry. Today, the square footage of a classroom has changed little from the turn of the century. The classroom square footage numbers are: 800 square feet for pre-k, kindergarten, and 1st grade, per 22 students a class; 700 square feet for elementary classrooms, per 23 students a class; 700 square feet for secondary schools per 25 students a class. These are considered small to standard class sizes, according to the Texas Education Agency Minimum School Facility Standards as set forth in section 66.1036 of the Texas Education Code. (T.E.C., 2003-61.CC.2)

The turn of the century represented a new birth in the United States public school system. This system consisted of grades divided into elementary and secondary systems,

thus washing out the old system of one room school houses. The Quency Grammer School built in Boston in 1847 is still in use and is the model school for our grade level system of today.

This building formed a new architectural type that was extensively copied in Boston and elsewhere, and this new building with it's twelve classrooms, assembly hall, and a principals office, was thought by many to represent such an advance that little improvement would ever be made on it. For the next fifty years it was the standard type of elementary school building erected in our cities... this was in large part due to the fact that this building was so well adapted to a drill and content type of course study, which from 1850 to about 1900 was the dominant one. (CEFPI, 1991, p. A5)

“In Granger, the original school was a wooden structure built in 1887, the second and third structures were built in 1906 and 1914 of brick and stone as was the trend in most school constructions after the civil war” (Mikulencak, 1992, p.3). Growth in student population caused the current school to be built in 1924. As mentioned before, this school was a modern structure of its day. This two story building was constructed on concrete pillars and joist, covered with brick, tile, and stone. The school featured massive metal framed windows and glass store front doors. Children were treated to the modern conveniences of the day, such as indoor plumbing, electric lights, and boiler heating. Most of the farm children who attended this school in its early years had never experienced these modern day conveniences. This scenario is the essence of school construction today, and is the purpose for new school construction as technology changes

our world at a rapid rate. Most children could only imagine their future as represented in pictures, if it were not for the opportunity to attend school and experience the emerging technology of the day, be it a flushing toilet of 1924, or a distance learning lab of 2005.

Learning Theories

We know from our past that children base their learning on the application of our current knowledge. Willard R. Daggett, the President of the International Center of Leadership in Education bases all of his speeches on emerging technology and its use in education. His belief is, in order for children to succeed in the future, they must be educated with the most current technology and knowledge of the day. Our schools will have to be built and redesigned to match these future changes.

Long before Willard Daggett preached his ideas of education for the future, men such as Heinrich Pestalozzi and John Dewey pioneered learning theories in the U.S. They encouraged schools to give up the regimented methods of drill and rote memory instruction. “Due to their efforts the average class size went from 50 pupils down to the lower 30s as knowledge increased concerning individual learning and child growth and development” (EFL, 1960CEFPI, p. A6). Dewey probably would have been proud of the 1924 Granger structure with its indoor cafeteria, auditorium, science lab and storage room, large central library, and multiple size classrooms to accommodate varied instructional purposes. Dewey proposed a classroom environment that was vastly different from what was common during his day. “He accused the traditional classroom of ‘mechanically missing’ the students through its passivity of attitude and uniformity of curriculum and method” (Lucas, 1972, CEFPI, p. A6). Is Dewey’s statement of 1928

applicable to our educational system today as it becomes more burdened with the regiment of accountability? Certainly our educational legacy will not be our test scores, but rather the creative individuals that our schools housed and educated.

The turn of the century was focused on educational reform in the elementary schools. Several experimental schools, reflective of progressive philosophy, were established and opened during this time.

“The Cook County Normal School, established by Colonel Francis W. Parker in 1883, The Horace Mann school in 1887, The Laboratory school of John Dewey, established in 1896, and the Spayer School established in 1899 at Teachers College, Columbia University, were examples of these institutions. These experimental schools were early attempts at developing educational programs that necessitated more space per pupil” (Cubberly, 1934, CEFPI, A6).

The early twentieth century ushered in the concept of the secondary school. The first secondary school facilities were merely reenactments of the elementary school buildings. After World War II, twice as many more students were now involved in public education and past secondary education becoming available to more people regardless of their gender. Consequently, schools would face a building boom in the mid 1900s. “The requirements for size and variety of space increased as program requirements in secondary schools diversified and broadened” (EFL, 1960, CEFPI, PA6).

Enter Lockers

With the creation of individual rooms as part of a school facility, the concept of elementary and secondary schools evolved to help specialize the education process for a

more quality delivery of instruction. In order to accommodate the expanded curriculum, children were required to be at school for much longer periods of time during the day and many more years. In this new process, schools provided very few instructional tools, and books were shared due to limited funding. Students were expected to provide their own school supplies, food, and transportation. This led to the need for individual storage areas (lockers) for the materials of a full day's educational process. As school populations grew in the mid 1900s, lockers became necessary for supplies, food, books, clothing, and even daily hygiene items.

Lockers replaced cubby storage units in classrooms because the cubby only accommodated the self-contained classroom concept, which was no longer used due to the secondary departmental concept. Student coat closets and storage rooms were abandoned for lockers due to their impractical use of space and inability to secure and separate students' personal items. Hall-lined lockers began to become the accepted practice of the day. These lockers were initially placed in the 8-10 foot wide halls not built for accommodating them. This changed the atmosphere of the public school academic facility. Prior to this time most changes in the academic facility were oriented around the inside of the classroom, and little thought was given to the outside of the classroom other than the exterior façade. Lockers introduced a major change in our secondary school facilities with little attention paid to the effect a locker would have on the learning climate, security, or cost efficiency. This study will investigate that effect, and attempt to determine if lockers are still an appropriate facility adaptation.

Exit Lockers

Historically lockers served a purpose in traditional secondary schools by their design and location. As our schools get larger due to a rapidly growing student population locker design and location have changed very little. This lack of adaptation of the individual student locker in relation to the size of a school has greatly complicated the individual student's organizational process. The effect is that few students today can effectively use their lockers due to large school designs and traditional locker locations. So why are we continuing to invest in individual student lockers when students can no longer benefit from their use?

If a part of our school is no longer serving the purpose it was designed for, why should its tradition take precedence over cost efficiency, school security and a better learning environment. School administrators and architects should consider breaking tradition in order to improve the learning environments. It is their duty to create a nourishing and supportive school climate through design. An example of the questions this research presents about lockers is being overlooked by the Austin Independent School District concerning Kealing Middle School, located in East Austin. "The lockers at Kealing Middle School have not been used for ten years. Next year, after new ones are added and existing ones are refurbished, they will still be locked shut. The district has denied an appeal made by teachers and administrators at this East Austin school to leave the \$60 thousand locker project out of the \$9 million plan to renovate the school and build new classrooms" (Thissen, 2006, p.B1). According to the school's administration, "the school stopped using lockers because they are noisy and could be used to hide drugs

and other contraband items. Officials also said students would cite time spent going to and from their lockers as an excuse to be late for class. Kealing's campus advisory committee, made up of parents, teachers and administrators, applied for an exception, but the district review committee rejected the appeal" (Thissen, 2006, p. B1).

Austin ISD's central office reply was: "the lockers are being built and refurbished to keep the school inline with the districts minimum requirements for what is included in a building, said Paul Turner, executive director of facility management for the district. They believe that it is a better decision to have the lockers kept up and repaired so if in the future there is an administration and a campus advisory committee that wanted to have lockers, they'd have that" (Thissen, 2006, p.B1).

Austin ISD facility management is obviously overlooking a strong movement at its middle schools to do away with lockers. "Nine of the districts seventeen middle schools don't use their lockers, said Ken Pfluger, a Kealing parent and member of the advisory committee. Why are we putting them in if we're not going to use them? Pfluger said. The experience of not having the lockers has been so positive that those of us who are involved in trying to get the district to change kind of look at each other and say, 'why are we doing this?'" (Thissen, 2006, p. B1&3).

According to Anito Uphans, an administrative supervisor with the district who serves on the committee that reviewed and denied Kealing's appeal, "the educational specifications were developed to provide a model for consistency across the district, both from campus to campus and from year to year. It was determined that the lockers should stay in the specifications because of it being a standard that is for the duration of the

building. Another school made the same request last year and the committee made the same decision” (Thissen, 2006, p.B3).

This example shows that a practiced and proven campus policy cannot effect district decisions regarding expenditures involving individual campus facility improvement. There is an obvious disconnect between Austin’s district and campus decision making due to antiquated facility standards. “The district’s standards created about ten years ago were reviewed before the 2004 bond election. The standards and committee were created to ensure that bonds paid for exactly what voters were considering” (Thissen, 2006, p.B3). Unfortunately for Austin’s lockerless middle schools, their standards were created before they had a chance to prove the worthiness of being a lockerless campus. The administration and parents at Kealing Middle School know that district policy can keep them from being innovative with their schools learning environment, security effort, and cost efficiency. A frustrated parent at Kealing made a statement that the district policy makers should consider; “But because the lockers haven’t been used for a decade with five different principals, Pfluger said, the district should do something else with the money: I don’t want my tax money to be wasted” (Thissen, 2006, p.B3).

This study is based on the theory that funds diverted from the antiquated technology and practice involving school lockers can benefit the total school environment by strengthening and simplifying security thus improving the physical and psychological aspects of a school that effect the teaching and learning processes.

The following section outlines the history of Texas school facility funding. This section emphasizes the need for accountability in local facility decisions.

Texas History of Funding Facilities

Billions of dollars are being spent each year building public schools in Texas. The mechanism for funding and maintaining these buildings has been a local responsibility in Texas since the 1880s, when the Texas Legislature permitted the per-capita fund to be used to construct school facilities. “In 1901 and again in 1909, lawmakers authorized the State Board of Education to invest the Permanent School Fund in school district bonds. In 1911, the Legislature created county boards of education and permitted them to consolidate common school districts into rural high school districts. State incentive aid for construction was made available at that time to encourage consolidation” (Walker, 1988, p 10). In 1949 the Gilmer-Aikin Act established the foundation for today’s school finance system. (Senate Bill 115-116-117, 1949) “The Gilmer-Aikin Committee that proposed the new finance plan made recommendations regarding equalized funding for facilities construction, but the Texas Legislature did not enact the recommendations because lawmakers expected increased school consolidations to make more efficient use of existing facilities” (Clark, 2001, p 683-684). For the next 22 years the state legislature left the funding of school facilities to the discretion of local districts. Moderate to high-wealth school districts could pass bonds for new facilities and low-wealth school districts did without new schools or allowed instructional programs to suffer in order to reallocate these funds for facility improvement. “Then in 1971 the Texas Legislature enacted an incentive aid program to provide construction funds for

facilities of school districts that agreed to consolidate. As with the previous incentive legislation, the program had little impact: few districts were willing to undertake the difficult task of consolidation” (Clark, 2001, p 684). In the 1980s, two circumstances forced legislative action concerning school facilities. One was a student population boom: “The student population continued to grow through the 1980s, resulting in a student population that increased from fewer than 2.5 million students in 1981 to 3.1 million students in 1990” (L.B.B., 1990-91). The second reason was the 1987 Edgewood lawsuit. This trial found in favor of the plaintiffs and Texas was under pressure to reform the school finance system, including funding for facilities. (Clark, 2001, p 686)

The Court found state aid to be inadequate because it fails to cover the cost of meeting mandated minimum requirements and it fails to provide state support for debt service and school facilities. (Walker 1989) In 1990, the Legislature passed Senate Bill 1 which provided numerous reforms addressing Edgewood requirements. It did not, however, address facilities funding. Instead, it added facilities and equipment to the expected uses for state foundation program aid, in effect making facilities support part of the existing Tier II of the foundation program. The district court recognized that Senate Bill 1 grants “modest equalization” of debt service through Tier II, but it criticized the lack of a plan. It also criticized the state for failing to substantially equalize access to funds for facilities. (Walker, 1990)

First State Funding for Facilities

“In 1997, with state revenue collections on the rise, the 75th Texas Legislature took action and created a separate, equalized system for supporting school facilities. In 1999 the Legislature enacted an even more extensive and costly program to provide state aid to help pay existing debt service obligations, another recommendation from the 1994 Senate Interim Committee” (Clark, 2001, p 692). These two laws resulted in the Instructional Facility Allotment (IFA, 1997) and the Existing Debt Allotment (EDA, 1999). “The result of IFA and EDA was to compress school district tax rates, leverage school spending for debt funded instructional facilities, and support increased facilities costs. The reduction in local participation is the direct result of state aid from IFA and EDA” (Clark, 2001, p 695). Unfortunately, for the children of Texas, this problem of financing school facilities has yet to be solved. On September 15, 2004, State District Judge John Dietz ruled in favor of West Orange-Cove against the State of Texas. “The decision meant a victory for the tripartite coalition of school districts- officially wealthy, middling, and poor- which had brought suit against the state to force action to reform the finance system first installed in 1993 and last determined to be constitutional by the state Supreme Court 1995” (King, 2004, p 1). In the summer of 2005, the state legislature failed to respond to Judge Dietz’s call for school finance reform. This case was being appealed to the State Supreme Court. In the mean time, rising property values throughout Texas will reduce state aid requirements, shifting more funding responsibilities for maintenance and operation, as well as facilities, to local taxpayers. (Clark, 2001, p 699)

Considering the climate of extreme financial accountability, school administrators will need to pursue cost efficiency in regard to new construction, renovation, and maintenance. The following section will explain cost/benefit and life-cycle costing in regard to planning and managing school facilities.

Cost Efficiency and Facilities

Texas has a long history of struggling with the process of changing its school finance system. Cost/benefit analysis is always the first issue considered when determining how to divide the money. Law makers want to know that tax dollars are being spent for programs that net results. Therefore, a proven pattern for building more productive schools is very desirable. In 2005, the 79th Texas Legislature considered a bill which would standardize the building of schools. This piece of legislation would have required new school buildings to be built almost exactly alike using limited models. The law was being promoted by law makers who felt that facility money was being wasted in the local decision making process. This bill was defeated with an argument that local control should usurp state mandates when the majority of funds are being raised by local tax payers. Judge Dietz supported this argument when he ruled in 2004 that “the state’s method of funding public schools shrunk in recent years to about 38% of the actual cost” (King, 2004, p 1).

CEFPI believes that stock plans are a poor choice when considering cost/benefit analysis:

Stock Plans. Attempts to reduce facility costs by eliminating professional services through the use of stock plans seldom produce satisfactory results. Because of

their inability to respond to unique program needs, stock plans should be avoided. Indeed, dollars saved by eliminating professional services are small compensation when the result is a school building that cannot accommodate the desired program. Stock plans present the additional problem of often not being adaptable to preferred or available sites. Local preference and pride in design and aesthetic appeal are also factors that have made stock plans unacceptable. (1991, p K3)

As long as Texas continues to rely primarily on local funding to support public schools, facility decisions will be made by local school boards. A school board's primary concern is with the cost of education and the efficiency of the school building. Today, students and parents have pressing issues about school security changing the traditional academic environment. Each group must be convinced that any new policy will serve public education in a positive manner. Rogers and Shoemaker summarize the findings of Paul Mort concerning his study of Columbia University's change process in the 1920s and 1930s.

1. The best single predictor of school innovativeness is educational cost per pupil.
2. A considerable time lag is required for the widespread adoption of new educational ideas. The average American school lags 25 years behind the best practices.
3. The pattern of adoption of an educational idea over time approaches an S-shape curve. At first only a few innovator schools adopt the idea, then the

majority decide the new idea is desirable, and finally the adopter curve levels off as the last remaining schools adopt. (Ball, 1987, p 29)

Organizations such as Council of Education Facility Planners International, support the local control process for the purpose of cost efficiency in building schools. CEFPI believes that each school community is unique and must design its schools to meet the changing needs of its community.

The twenty-first century will bring demographic and economic changes that make a thoughtful educational plan indispensable. Because America's population is aging, the large taxpaying public that supports public schools has fewer direct connections-that is, children- to those schools. A large proportion of America's student body represents the current wave of immigrants, building diverse school populations with kaleidoscopic cultural and linguistic backgrounds. In some Western states, people of Hispanic descent form the majority of the population. This trend is expected to continue. (CEFPI, 2004, p 1-2)

Texas is a good example of a state that is experiencing demographic changes. According to Dr. Steve Murdock, the State of Texas Demographer, "96 percent of the net addition to the Texas population, between now and 2040 will be non-anglo and eight out of ten in the states public schools will be non-anglo" (Kronberg, 2003, p 1). This changing student population will drive the evolution of our local schools. Our school building's must be built to match the needs of our new student population in a cost efficient manner.

Public schools still hold the potential to be community centers of learning.

However, educators recognize that they may have to address a different group of customers and offer different services in their facilities than schools provided in the past. School leaders must discover the learning needs of their communities and be sure each district provides its constituents with the means to meet those needs. Thus, a key preliminary step for planners is understanding how change occurs and identifying factors that influence communities' ability to effect and control change. (CEFPI, 2004, p 1-2)

Parameters of cost efficiency for a school will be determined by local policies, and these policies can be evaluated by life-cycle costing and cost/benefit analysis. "Both techniques provide information that can improve decision making by supplying objective reliable criteria with which site, building design, mechanical system, or pieces of furniture can be appraised in relation to others. Life-cycle costing and cost/benefit analysis are important because they allow an informed selection among alternatives based on total rather than initial costs and an examination of cost in terms of value received" (CEFPI, 1991, p K7).

Life-cycle Costing

Life-cycle costing evaluates the initial purchase cost of products versus the long term cost involved in the ownership of these products. A school locker, for example, has an initial square footage cost, equipment cost, and institution cost. During ownership there will be a maintenance cost for the life of the lockers. "Attention should be given to total costs, which include the initial costs of a structure (or any of its components) as well

as interest and the cost operation and maintenance. The objective is to determine the best method of satisfying a particular requirement at the least total cost. The cost of operating an educational facility includes the expenses incurred in servicing the building, such as heating, lighting, insurance, and labor. Maintenance costs are those resulting from repairs and renewal” (CEFPI, 1991, p K7). In practice, life-cycle costing is complex because of the many factors that must be considered. Some of these costs can only be estimated, which further complicates this process. This technique should be employed by experienced individuals who thoroughly understand the full implications of cost and building design at the local level. Experience with a product or careful examination of the product literature can result in effective life-cycle costing. “The merits of life-cycle costing are not only that it improves economy by developing an awareness of total costs and a comparison of alternative systems, but that it also encourages an examination and understanding of the interrelationships between various aspects of building design and their costs” (CEFPI, 1991, p K7).

Cost/benefit Analysis

Cost/benefit analysis is a concept more closely related to student performance because it views building design and commodities in terms of benefits provided to the building inhabitants. In practice, cost/benefit analysis matches the best set of design features to the local needs considering expense as the primary variable. “Cost/benefit analysis requires that benefits be expressed in monetary terms. However, it is often difficult to reduce benefits to a dollar figure, particularly when they are intangible. For example, how can beauty of comfort be measured in dollars? Although these qualities

are quite real and important, they are valued differently by different persons. One way of evading this dilemma is to cancel out such benefits when they are common to all the alternatives considered” (CEFPI, 1991, p K8).

Cost/benefit analysis can be applied when evaluating a lockerless school’s need for additional books. The expense of the books should be analyzed for potential benefits. The local decision makers must decide if additional textbooks weighed against the savings of no locker costs have an educational benefit. A tangible cost/benefit factor could be realized in less lost textbooks or less damaged texts. An intangible benefit would be having the textbook available in the classroom or at home for ease of student access; thus eliminating the need for textbook locker storage and textbook transportation. “Because both costs and benefits are experienced over a period of years, it is essential that they be viewed in terms of life-cycle costs, not just acquisition costs” (CEFPI, 1991, p K8).

Adequacy

Cost efficiency is useless in a discussion about school facilities without parameters of adequacy to define the discussion. The old adage “If it was good enough for my parents and me, then it’s good enough for my child,” does not adequately define school facilities in a constantly changing vision to meet the present day demands of education. In the 1980s court decision standards for an adequate school facility were stated as:

School facilities must be structurally safe, contain fire safety measures, sufficient exits for safe and easy flow of traffic, an adequate safe and potable water supply,

an adequate sewage disposal system, sufficient and sanitary toilet facilities and plumbing fixtures, and adequate general instructional administrative and custodial storage. All facilities must be adequately lighted, in good repair and attractively painted. Facilities must be designed to prevent loud noises from traveling from one section of the building to another. (Pauley vs. Bailey, 1982)

In Texas the Edgewood litigation in the 1990s and the West Orange-Cove litigation in 2004 had a common recurring theme; the state failed to provide adequate funding for public school facilities. With these court cases in mind, cost efficiency can not be seen only as expenditures, but must be compared to the facility's ability to produce adequate student achievement. The CEFPI Guide for School Appraisal assesses educational adequacy. In assessing school facilities, it is important to assure that they support all educational programs and provide the maximum potential for student learning. Planners should consider the following factors in assessing educational adequacy:

Room Features. Elements such as casework and marker boards are typically listed in an educational specification for a student classroom. Providing a cost estimate for the purchase of additional casework and marker boards to meet school district standards may help emphasize the importance of these elements.

Adjacencies. The location and relationship of program areas within the facility is another important factor in assessing educational adequacy. For example, administrative offices should be located at the building's main entrance, within sight of the front door and the main parking lot. If the facility is

zoned for both community use and its current educational function, the physical education spaces and cafeteria should be isolated from the rest of the building, to allow for convenient and safe public use when the facility is closed.

Square Footage. Student space is also an important factor in assessing educational adequacy. All facilities should be assessed using the school district's standards for square footage for each grade and program level. Providing standards for all program areas, including classrooms and support services, makes possible a more detailed assessment of each facility.

Safety and Security. Districts should develop criteria for assessing safety and security within each facility and throughout the school district. Planners may have access to these. In absence of existing criteria, building code standards and advice from architects and building inspectors may provide the basis for analysis of existing structures.

Capacity Analysis. Building capacity is best determined by the amount of classroom space needed to address the specific educational program needs of the students in the facility (The method of counting the number of classrooms and multiplying by a predetermined number of students per classroom is no longer used to calculate building capacity). To accurately determine building capacity, it is essential to identify programs that are currently housed in the facility and to anticipate future programs that may

be introduced. For example, most special-needs students require extra space. Thus, a classroom originally designed to house twenty-five students may currently house only fifteen to twenty special-needs students. Educational programs that emphasize “hands-on” instruction in preference to traditional classroom lectures also have different space requirements (While “hands-on” instruction requires more square footage, classroom size may be reduced to address the specific needs of a smaller number of students). Building capacity is best determined by establishing standards for square footage at all grade levels.

Many secondary schools have been built recently without lockers to help provide these school building’s educational adequacies. The no locker policy allows more square footage to be put into classroom or lab space. The non-congesting hallways of a lockerless facility help the students and staff move efficiently to adjacent rooms or appointments. Room features in a lockerless school can be added due to savings by not purchasing lockers. A lockerless building’s elimination of an old 20th century technology allows for better capacity. Finally, the absence of lockers aids in a safer, more secure building by eliminating hiding places for contraband. An adequate school is one that services students’ educational needs today by preparing them for the future. An efficient school is one that is built by making timely decisions in the planning stages that allow for cost savings during construction and in future maintenance or renovation. “Many owners focus almost exclusively on capital costs when considering system selection; however, they are learning to take a longer view. According to the General Services

Administration, first costs represent 10 percent of total life-cycle facility costs, while operational costs account for 90 percent of the total facility costs” (Brooks-Pilling, 2005, p 26).

School facilities costs have increased due to safety and security requirements. The following section will explore these requirements as they relate to facility planning and lockerless schools.

Safety and Security Regarding Facilities

Initially school safety was concerned with building health, fire prevention/evacuation, and tornado drills. These elements that threatened the inhabitants of the school were common building code concerns for all public buildings. Recently, other threatening actions have begun to occur at our nation’s schools with increasing frequency. The incident of targeted school violence has grown at an alarming rate. In the 1970s there were three reported attacks, in the 1980s eight, and from 1992 to 2000 twenty-nine incidents of targeted school violence were committed. (Vossekuil, 2002, p 47) The Department of Education reported that nearly 60 million children attend the nation’s 119,000 plus schools. (US Dept Ed, 2002) The US Secret Service and the Department of Education have recorded 37 attacks of lethal means (e.g. a gun or knife) committed by 41 individuals over a 25 year period. These numbers represent an extremely small percentage of occurrence for targeted school violence.

Nevertheless, the impact of targeted school-based attacks cannot be measured in statistics alone. While it is clear that other kinds of problems in American schools are far more common than the targeted violence that has taken place in schools in

this country, the high-profile shootings that have occurred in schools over the past decade have resulted in increased fear among students, parents, and educators. School shootings are a rare, but significant, component of the problem of school violence. Each school-based attack has had a tremendous and lasting effect on the school in which it occurred, the surrounding community, and the nation as a whole. In the wake of these attacks, fear of future targeted school violence has become a driving force behind the efforts of school officials, law enforcement professionals, and parents, to identify steps that can be taken to prevent incidents of violence in their schools. (Vossekuil, 2002, p 7)

School administrators know that their school security issues are much broader than the spotlighted issue of targeted school violence. To address their concerns:

More and more school districts are adding metal detectors, police resource officers, anonymous tip lines, 24-hour surveillance cameras, dress codes, and uniforms. Quite simply school security is the prevention of crime at a school campus. With the increase in school-related crime, safety has taken on a high priority in American schools. Architects and planners recognize the need to design safe school environments to support the quality of instruction. The National Crime Prevention Institute, a program at the University of Louisville, Kentucky, has defined a movement called 'Crime Prevention through Environment Design' (CPTED) as the proper design and effective use of the built environment [that] can lead to a reduction in the fear and incidence of crime, and an improvement of the quality of life. (CEFPI, 2004, p 5-25)

Security Design Elements

Security design elements must be considered when building a new school or renovating an old one. School planners and architects must integrate current technology to enhance building security and help prevent school crime. Crime Prevention Through Environmental Design (CPTED) has outlined a set of principles to enhance crime prevention in new buildings or remodeled schools:

Natural Surveillance. A design concept directed primarily at keeping intruders easily observable. Promoted by features that maximize visibility of people, parking areas and building entrances; doors and windows that look out on the streets and parking areas; pedestrian friendly sidewalks and streets; front porches; adequate nighttime lighting.

Territorial Reinforcement. Physical design can create or extend a sphere of influence. Users then develop a sense of territorial control while potential offenders, perceiving this control, are discouraged. Promoted by features that define property lines and distinguish private spaces from public spaces using landscape plantings, pavement designs, gateway treatments, and 'CPTED' fences.

Natural Access Control. A design concept directed primarily at decreasing crime opportunity by denying access to crime targets and creating, in offenders, a perception of risk. Gained by designing streets, sidewalks, building entrances, and neighborhood gateways to clearly indicate public routes and discouraging access to private areas with structural elements.

Target Hardening. Accomplished by features that prohibit entry or access; window locks, dead bolts for doors, interior door hinges. (Howe/CEFPI, 2004, p 5-26)

Additional safety and crime prevention considerations are outlined by CEFPI

1. Separate pedestrian and vehicular traffic on the site. This includes car, bus, and service traffic.
2. Reduce speed limits around the school to slow traffic.
3. Provide power backup for the communication system (intercom and telephones).
4. Make doors and walls create no blind spots.
5. Provide ample lighting in the parking lots and around the building.
6. Locate parking as near the building as possible, for evening use. Parking areas should be designed for ease of supervision.
7. Consider security technology such as keys, smart cards, metal detectors, alarm systems, and surveillance equipment.
8. Make corridors wide enough to decrease crowding, as conflicts can ensue when too many people are confined in a small space.
9. Locate lockers near classrooms, to minimize student movement through corridors. (CEFPI, 2004, p 5-26)

Of these nine recommendations three relate indirectly to school lockers and one mentions school lockers directly. Number four and seven refer to visibility and surveillance.

School corridors are a primary area for surveillance either by camera or by school staff.

The locations of lockers in these areas create thousands of blind spots that cannot be monitored. In the article *Designing for Safety- How School Design Can Enhance Security*, architects Geoffry Dodan and Peter Samton list visibility as the most crucial concern when building to enhance security:

Visibility is crucial when planning a school as well. School security is not unlike security on the street or in any public place where groups of people have an inherently positive effect on each other by providing accountability and supervision. In schools, faculty and administrators strive to have students move around amicably. Straight lines of sight are useful for navigating, keeping the peace, and maintaining safe areas of passage. The advantage of straight corridors with clear lines of sight is that everyone-students, faculty, visitors- is visible at all times. (p 19)

Number eight directly refers to the school corridor as a place for potential conflict or crime due to crowding. The addition of lockers to school corridors enhances the problem by forcing more people through smaller spaces.

Finally, number nine refers to lockers directly. This recommendation is to locate lockers close to classrooms and minimize student corridor movement. This is a statement that seems to contradict itself when considering the natural arrangement of lockers in academic hallways. Howard Koering, superintendent of the 6,271 student Central Islip district, recommends “Schools should be planned with sufficient locker space so students can put their coats or other outdoor wear away when they arrive. No student should ever wear outdoor gear inside the classrooms or other instructional areas. In addition, students

should understand that lockers are school property, and as such are on loan and are subject to inspection at any time” (Dodan, 2002, p 20). These two statements seem to be calling for more student lockers or more access to lockers. The fact of the matter is that school administrators and architects have not solved the problem of school locker location. When lockers are placed in corridors four of the nine CEFPI crime prevention considerations are compromised.

Security Provides Comfort

School safety and security can be addressed by building schools that have physical characteristics that create comfort zones. The U.S. Secret Service and Department of Education, in their manual *Threat Assessment in Schools-A Guide to Managing Threatening Situations and to Create a Safe School Climate*, recommend creating an atmosphere that allows students and staff to feel safe.

Building structure, facility safety plans, lighting space, and architecture, among other physical attributes of educational institutions, all can contribute to whether a school environment feels, or is in fact, safe or unsafe. In large schools, school administrators may wish to explore changes in the physical characteristics of the school that would permit the assignment of teachers and students to smaller, mutually intersecting and supportive groupings within the broader educational community. (Fein, 2002, p 71)

Everyone wants to feel that their child is attending a safe school. High profile safety awareness programs involving all school stake-holders helps to promote a secure

environment. Schools can be built to promote involvement and consequently improve supervision.

Architect Oscar Newman, author of *Defensible Space: Crime Prevention Through Urban Design*, argues that when groups of people come together, they automatically have a beneficial impact on each other because they become, in effect, each other's supervision. It is healthy to have built-in supervision in a public place, Newman says. Rather than isolated buildings in a residential neighborhood, for example, it is better to have many doorways and windows looking out. This has the effect of many people monitoring each other all the time. (Dodan, 2002, p 19)

Crime is greatly decreased when the criminal is at risk of being identified. Lockers can provide hiding places for storing drugs or weapons. In the absence of lockers, criminals must carry such contraband on their person, causing greater risk of being convicted of a crime. Dog searches can be conducted on student backpacks or purses by asking students to leave these storage items in the room while the dog searches. This practice also adds a measure of risk to the criminal activity. Such simple lockerless procedures can reduce the comfort zone for criminal activity, thus improving the comfort zone for students and staff.

Researchers have studied the negative and positive effects that school facilities have on learning environments and behavioral settings. This body of information has a direct correlation to the facility adaptation of lockerless schools.

School Building Environment Effects Learning

In the past twenty five years, extensive studies have been conducted to determine the effects of facility on student achievement:

Environmental issues, such as indoor air quality, ventilation, and thermal comfort, affect not only students' health and comfort but morale and their ability to focus on schoolwork. Lighting, acoustics, and building age, quality and aesthetics also bear on young people's attitudes toward education in general, toward their schools, and toward their own achievement. School size and class are also facility issues that, as we have seen, have a great deal to do with student achievement levels and social adjustment. (CEFPI, 2004, p 2-6)

Many studies suggest that the design of good teaching such as instruction, pedagogy and curriculum are strongly tied to adequate facilities.

John B Lyons (2002), founder of the National Clearinghouse for Educational Facilities, agrees. In an essay for Learning by Design, Lyons remarks, "It has been said that a good teacher can teach anywhere, but a growing body of research strongly suggest a direct relationship between a school's condition and the learning that goes on inside it. The classroom is the most important area within a school. It is here that students spend most of their time, hopefully in an environment conducive to learning. Such an environment requires a reasonable level of concentration, listening, writing, and reading. Individual classrooms and entire facilities need to be evaluated, not only on how they meet changing

educational requirements, but also on how they meet the environmental requirements for health, safety, and security. (CEFPI, 2004, p 2-7)

Our school's physical condition sends a message of the importance that the community places on education to our children.

Lyons (2002) observes that 'as early as 1982, a report reviewed eighty-eight published studies and concluded that old and obsolete buildings have negative consequences for the learning process while safe, modern, controlled environments enhance it.' Four recent studies that evaluated the relationship between school buildings and student achievement found higher test scores for students learning in better buildings and lower scores of students learning in substandard buildings. A recent report evaluating school facilities in Milwaukee completed by the Council of Educational Facility Planners International, showed a difference in student test scores ranging from 5 to 17 percentile points. 'Facility condition may have a stronger effect on student performance than the combined influences of family background, socioeconomic status, school attendance, and behavior,' the report concluded. (CEFPI, 2004, p 2-7)

The message of education status is transmitted by the big picture of the school facility. The condition of the classroom is important, but everything that supports the classroom is of equal importance; the corridors, auditoriums, cafeteria, gym, building facade, grounds, etc.. Everything, inside and out, and school's physical appearance, imparts the vision of the schools' educational expectations. "A strong correlation exists between the design of a facility and the achievement of the students who attend school there. Research clearly

demonstrates the accuracy of this intuitive truth and shows that educational planners need to take every opportunity to enhance teaching and learning through purposeful design of school buildings and grounds. Over the past five years, researchers have concluded that many more factors affect student achievement than simply how the teacher imparts information” (CEFPI, 2004, p 2-2).

Psychological Effects of Learning Environments

The condition of our schools is a symbolic message to our students, teachers, and parents, of the value that the community places on education. A beautiful, well maintained school will send a positive message to all school stake-holders that education is a priority. A building that lacks heat, is unsafe, is inadequately equipped, and is poorly maintained, sends a negative message to the students and faculty (Lackney, 1999). Our schools provide a setting where students, parents, teachers, and the community at large, interact (Vline, 1997). School facilities are loaded with symbolic overtones (Ortiz, 1994). These overtones affect the parents’ perceptions of quality education, the students’ expectation of performance objectives and teachers’ attitude about productivity.

Many studies in urban and high poverty school systems have discovered a correlation between poor building health and how students perform. Conditions such as peeling paint, crumbling plaster, nonfunctional toilets, poor lighting, bad air quality, malfunctioning climate control, and poor aesthetics can harm the learning environment and compromise the health and morale of staff and students. A national survey conducted by the American Association of School Administrators found that 74 percent of school facilities should be repaired immediately; another 12 percent were identified as

inadequate places of learning. (Hanson, 1992) In 1988 the Carnegie Foundation called for the same level of commitment as described in the Higher Education Act of the 1960s to be directed toward overhauling the nation's public school facilities. (Carnegie Foundation for Advancement of Teaching, 1988) Students, teachers, and parents are negatively effected by poor school facilities and positively effected by adequate school facilities. People are influenced and affected by their environment. (Hanson, 1992)

Impact on Student Achievement

A study of the District of Columbia school system found, after controlling for other variables such as a student's socioeconomic status, that students' standardized achievement scores were lower in schools with poor building conditions. Students in school buildings in poor condition had achievement that was 6% below schools in fair condition and 11% below schools in excellent condition. (Edwards, 1991)

Cash (1993) examined the relationship between building condition and student achievement in small, rural Virginia high schools. Student scores on achievement tests, adjusted for socioeconomic status, was found to be up to 5 percentile points lower in buildings with lower quality ratings. Achievement also appeared to be more directly related to cosmetic factors than to structural ones. Poorer achievement was associated with specific building condition factors such as substandard science facilities, air conditioning, locker conditions, classroom furniture, graffiti, and noisy external environments.

Similarly, Hines' (1996) study of large, urban high schools in Virginia also found a relationship between building condition and student achievement. Indeed, Hines found

that student achievement was as much as 11 percentile points lower in substandard buildings as compared to above-standard buildings.

A study of North Dakota high schools, a state selected in part because of its relatively homogeneous, rural population, also found a positive relationship between school condition (as measured by principals' survey responses) and both student achievement and student behavior. (Earthman, 1995)

McGuffey (1982) concluded that heating and air conditioning systems appeared to be very important, along with special instructional facilities (i.e., science laboratories or equipment), and color and interior painting, in contributing to student achievement. Proper building maintenance was also found to be related to better attitudes and fewer disciplinary problems in a cited study.

Research indicates that the quality of air inside public school facilities may significantly affect students' ability to concentrate. The evidence suggests that youth, especially those under ten years of age, are more vulnerable than adults to the types of contaminants (asbestos, radon, and formaldehyde) found in some school facilities. (Andrews and Neuroth, 1988)

Impact on Teaching

Lowe (1988) interviewed State Teachers of the Year to determine which aspects of the physical environment affected their teaching the most, and these teachers pointed to the availability and quality of classroom equipment and furnishings, as well as ambient features such as climate control and acoustics as the most important environmental

factors. In particular, the teachers emphasized that the ability to control classroom temperature is crucial to the effective performance of both students and teachers.

“A study of working conditions in urban schools concluded that ‘physical conditions have direct positive and negative effects on teacher morale, sense of personal safety, feelings of effectiveness in the classroom, and on the general learning environment.’ Building renovations in one district led teachers to feel ‘a renewed sense of hope, of commitment, a belief that the district cared about what went on in that building.’ In dilapidated buildings in another district, the atmosphere was punctuated more by despair and frustration, with teachers reporting that leaking roofs, burned out lights, and broken toilets were the typical backdrop for teaching and learning” (Corcoran et al., 1988).

Corcoran et al. (1988) also found that “where the problems with working conditions are serious enough to impinge on the work of teachers, they result in higher absenteeism, reduced levels of effort, lower effectiveness in the classroom, low morale, and reduced job satisfaction. Where working conditions are good, they result in enthusiasm, high morale, cooperation, and acceptance of responsibility”.

Schneider’s (2002) study focuses on how teachers evaluate the design of schools, rating such things as the adequacy of lighting, the availability and adequacy of specialized facilities (such as science labs and music rooms), and the size of the school. The report then examines how teachers evaluate the condition of various aspects of their schools, including such things as indoor air quality, noise levels, and thermal comfort. (Schneider, 2002, p 5) Of the 11 inputs about which teachers were queried, on average,

over 75% of the teachers found their school facility, the participation of the community, a good principal, good materials, appropriate class size, and discipline, very important to their overall performance as teachers. Ranking as the least important, overall, were the central administration and collegiality. (Schneider, 2002, p 5) A Carnegie Foundation (1988) report on urban schools concludes that “the tacit message of the physical indignities in many urban schools is not lost on students. It bespeaks neglect, and students’ conduct seems simply an extension of the physical environment that surrounds them.” Similarly, Poplin and Weeres (1992) reported that, based on an intensive study of teachers, administrators, and students in four schools, “the depressed physical environment of many schools... is believed to reflect society’s lack of priority for these children and their education.”

Physiological Effects of Learning Environments

Physiological studies on how the brain learns have revealed new insight about teaching and learning environments. This research can provide some relevant information to school administrators and architects about the schools we design that provide most of the environment in which childrens’ brains learn. Caine and Caine (1990) make the point that brain-based research is not a separate movement in education, but an approach from which all education will ultimately benefit. With far-reaching implications, brain-based research provides insights even into the design of buildings and grounds-the physical environment in which young brains learn.

In his new book, *Teaching With the Brain in Mind*, Eric Jensen (1998) observes that we all want solutions to educational challenges and problems, but cautions

that we must be careful about how we apply new discoveries. Then someone promotes a particular approach to learning as being brain compatible, it may not be the final word on the topic. But Jensen affirms that interest in brain-compatible learning is here to stay. It will come to affect nearly everything we do, including teaching strategies, discipline, music and art, special education, curriculum, technology, learning environments, teacher training, assessment, and organizational change.

Educational facility planners will be well served by designing schools with brain learning principals rather than continuing to reproduce old designs. “School facilities, however, have been often built in a reversal of the ‘learning brain.’ Often, facilities are designed and built for the high school student rather than the needy young brain. We spend inordinate amounts of money on elaborate new school buildings with little consideration for the need of young children, and even more critically, we place many technological gadgets in those buildings that negate what we do know about how the brain learns” (Chan, 1998, p 13).

Eric Jensen (2003) in his book *Environments for Learning* explains the connection between teaching and facilities:

To the extent possible, the physical environment of an optimal classroom is aesthetically pleasant, attractive, colorful, comfortable, and engaging to the senses. Since the environment is a variable that can be easily enhanced, it makes good sense for teachers to take full advantage of it. Students ought to be provided with an almost constant opportunity for sensory stimulation- things to hear, touch,

see, and smell- up to many times the amount of material conventionally introduced in traditional classrooms. (p VIII)

Brian Friendly Environments

Jensen presents the concept of brain friendly schools by suggesting that schools be designed primarily for improving student sensory perception. The chapters of his book are “What Students Feel, See, Hear Smell, Taste and Breath.” Jensen indicates that these senses can be stimulated negatively or positively by the learning environment.

How students feel mentally about their school environment is as important as what they feel physically. Consequently, school safety is equally important as ergonomics, classroom size, and temperature control. “Therefore, we can make a huge difference in our classrooms by realizing the importance of tending to physical and emotional climate with careful planning and a heightened awareness of the importance of student comfort and safety” (Jensen, 2003, p 1).

Recent studies suggest that, whether perceived or real, the threat of violence in the learning environment can have a negative impact on cognition. Specifically, the stress associated with violence impacts test scores, absenteeism, tardiness, and attention span (Hoffman 1996). Scientists know that the learning brain does not respond well to real or imagined threats of harm. Such environments trigger the amygdale (the brain’s fear and emotional response center) to release an overabundance of cortisol and adrenaline. When the stress state is triggered, the body goes into ‘fight or flight’ mode: its first and sole priority is to ward off danger. This state, when chronic, shuts down formal learning. (Jensen, 2003, p 1)

Size of Learning Spaces

The size of the learning space will cause a child's brain to produce chemicals that benefit or inhibit the learning process. "Large classes tend to generate more 'safety' and 'threat' concerns, which ultimately impact cognition. The larger the group, the more social-status groupings tend to be formed, which influence serotonin and cortisol levels. Generally, when we feel safe we have a higher serotonin level; when we feel unsafe or stressed we have a higher cortisol level. Chronically high cortisol levels are bad for the body and learning" (Jensen, 2003, p 8).

Temperature Effects Learning

The human brain is extremely temperature sensitive:

Up to a point, the cooler your brain is, the more relaxed, receptive, and cognitively sharp you are. Generally, cooler (not cold) is better than warmer (or hot). Our body, for example, can adjust to a room that is 5 degrees too cold better than one that is 5 degrees too hot. However, classrooms kept between 68 and 72 degrees Fahrenheit are most comfortable for the majority of students (Harner 1974). Harner reports that an ambient temperature of approximately 70 degrees is ideal for most learning situations, particularly those involving reading and mathematics, in which optimal focus and concentration is required. (Jensen, 2003, p 9)

Jensen also states that:

Classroom temperature is often overlooked and is an essential element for establishing a comfortable learning environment. Rooms kept between 68 and 72

degrees Fahrenheit are most comfortable for the majority of students. Provide good air circulation by opening windows and doors if weather permits. School buildings with central temperature controls can be very frustrating for teachers. We expect teachers to work miracles with students each day, yet they may not even have control over the most basic environmental conditions. (Jensen, 2003, p 10)

Light, color, and peripheral stimuli all affect the way our brain prepares for learning. Jensen recommends that schools “maintain a constant, adequate level of bright lighting (at least 2,000 lux) in your classroom. Bright lighting helps reduce drowsiness in class by suppressing the production of melatonin in the brain” (2003 p 14).

Color Effects Learning

Educators are beginning to understand what advertisers have long professed, that color will enhance moods, emotions, behavior, and possibly connect to cognition. “For instance, researchers Shaie and Heiss noted as early as 1964 that regardless of age or cultural background, short-wavelength colors, what we commonly call the warm colors (red, orange and yellow)- are highly arousing, although not necessarily pleasing.

Conversely, long wave-length hues- what we commonly call the cool colors (blues and greens)- have a calming, relaxing effect. The majority of people, the researchers noted, identify cool colors as the most pleasant” (Jensen, 2003, p 16). Jensen also states that:

Classroom walls can be used to support useful peripherals and visuals. Simple enhancements can be made with color. The shades, tones and hues you use on the walls are important. Color consultants suggest that the predominant colors ought

to be a subtle green with yellow, orange and blue used as highlights colors. Some teachers have found certain yellows to work-well also. The colors around us influence our mind states and create unconscious reactions. Wood paneling or brick-face can create a warm, home-like feeling. (p 17)

Peripheral Stimuli Effects Learning

Appropriately placed peripheral stimuli can influence different types of learning: “For maximum absorption of your most important instructional content, post visuals on side walls of the classroom above eye level. Do not purposely draw attention to the postings, but allow students to discover them for themselves. Since subconscious peripheral messages are often more powerful than the standard front-of-the-room approach, be sure that all of your postings are positive, focused, interesting, and accurate” (Jensen, 2003, p 18). “The actual positioning of visuals on the wall can make a difference in how students are impacted. For example, stronger feelings are evoked when a poster is below students’ eye level, while right at eye level stimulates learners to talk about the poster. If you want students to simply notice information, such as in the form of a review, put it above eye level which stimulates the visual mode for recall” (Jensen, 2003 p 20). On the other hand visual clutter can inhibit learning. Studies suggest that a cluttered learning environment can impair cognition. “Such environments cause the eye to dwell on a scene for significantly longer periods in a effort to ‘make sense’ of the chaos- a task that requires substantial cognitive energy and detracts from meaningful learning time” (Vecera, et al. 2000). A disorderly environment, research suggests, conflicts with the brain’s natural tendency (occurring in the visual cortex and frontal

lobe) to perceive our surroundings as an organized whole a process necessary to obtaining meaning validity. Ward and Duncan (1996) found that how the brain perceives objects in relation to one another subconsciously guides our behavior and reaction to our environment.

Sounds Effects Learning

What a student hears during their school day can have physiological implications that effect cognitive processes: “Evans and colleagues (2001) found that children in noisier areas had higher blood pressure, heart rates, and elevated stress levels, factors that aren’t conducive to learning. Scientists know that excessive chronic stress causes the brain to release abnormal levels of cortisol, a hormone that binds receptors in the hippocampus, a brain area important to memory and learning. Over time (1-2 months), acute levels of cortisol can kill brain cells and inhibit recall.” “In poorly designed classrooms that fail to address and reduce ambient noise, echo effects, reverberation, and other acoustical problems, student attention, off-task behaviors, and discipline problems increase- issues that take a serious toll on learning” (Berg et al 1996). “When learners have to strain to hear what their teacher is saying and teachers have to constantly adjust their volume to compete with ambient noise, valuable content learning time is sacrificed, unconsciously if not consciously” (Jensen, 2003, p 23). Jensen suggest several methods for educators and school designers to consider when ambient noise is a problem. “If you suspect a significant problem with ambient noise, consult your school administration or an acoustical engineer on the most efficient way to eliminate the distractions. Allergy-

sensitive carpeting, drapery, sound absorbing panels, wall hangings, and commercially available sound amplification systems may be options to explore” (Jensen, 2003, p 27).

Human Senses and Learning

What a student smells, taste and breathes will have an effect on cognition: For example, Pauli and colleagues (1999) reported that undergraduate psychology students experienced significant cognitive enhancement in word-association and word-naming tests after being exposed to background odors of vanilla. Similar results were noted by Schaubelt (1999) in learning environments using scents of lavender. And in a 40 minute test of vigilance (similar to that given to air traffic controllers and long-distance drivers), production workers that received 30 second burst of peppermint of nugget (lily of the valley) every 5 minutes showed a 15 to 20% improvement in performance (December & Parasuraman 1993).

The air a student breathes while in a learning environment will effect his/her cognitive processes. According to Jensen (2003): “When it comes to air, the more negatively charged it is, the better. When the electrical charge in the air is too positive, it can cause you to feel groggy, lethargic, sleepy, or depressed” (p 36). He also notes that: “Many lethargic or under performing learners may simply be highly susceptible to the ionization changes in the air. You may want to introduce an environmental ionizer into the classroom to improve air quality. Be sure to get one that matches, in power, the size of your room. Sometimes opening a window or door can also improve air circulation and quality. Highly negatively charged air can be found in environments where there is a lot

of plants, rushing water, wind over water, or humid areas” (p 36). School facilities and cognition have a physiological relationship to enriched learning environments.

High Performance Learning Environments

If our students are going to be successful in the current environment of high-stakes achievement testing, attention should be focused on all beneficial best practices in teaching as well as facilities.

One study (Ayers 1999) examined the relationship between high school facilities and student achievement. The researchers used the Design Appraisal Scale for High Schools (DASH-I) to measure the different design variables and determine a total quality score for each school in the study. Based upon the results of the analyses, school-design variables explained approximately 6% of the variance in English and Social Studies performance; 3% in Science performance, and 2% in both Mathematics and Writing performance (ibid). Another researcher (Anderson 1999) studied the influence of 38 middle-school design elements on student achievement as measured by the eight-grade Iowa Test of Basic Skills (ITBS). The Design Appraisal Scale for Middle Schools (DASM) was applied during site visits. The analysis revealed that 27 of the 38 DASM design factors positively correlated to the composite ITBS scores. The most influential design elements included: (1) Multi-functional in nature; (2) Sufficient play areas; (3) Functional activity pockets; (4) Enough green areas; (5) Exit doors to the outside; (6) Overall positive impression; (7) Administration centrally located; and (8) Overall school aesthetics.

With the current student testing requirements in federal education No Child Left Behind laws, innovative school architectural firms will profit from designing schools that improve student academic performance. School administrators will seek to enhance their schools learning environments by directing funds to facility projects that improve the physiological effects of their school. Consequently, teachers and students will benefit from a healthier, brain friendly learning environment.

Need for Future Studies

All research indicates a relationship between the campus environment and how students and teachers perform. While extensive research exist connecting the specifics of the classroom environment to student success, more research needs to be conducted on how the auxiliary learning spaces of schools effect learning. Every aspect of the brain friendly environment can be extended to the schools corridors, cafeteria, gyms, auditoriums, and grounds. If our students classrooms are safe, brain-friendly learning environments but the auxiliary spaces where our students spend up to one half their school day are not brain friendly, then we are only addressing half the problem. These auxiliary spaces are not as dominant in the learning environment as the classroom, but they share an equal importance in their physiological and psychological effects on the student and teacher. If our auxiliary spaces are enriched learning environments inspired by art and architecture then the students' full school day can be an inspiring educational experience. "We need aesthetically well-designed school buildings (both the architecture and the landscaping) to serve as an engaging, challenging and arousing piece of art. It

serves as an enriched environment to challenge and interact with brain growth” (Chan, 1998, p 13).

Change is always accompanied by criticism. This type of ridicule often prevents progress in the planning stages of school facilities. The following section reveals criticisms of the lockerless school environment.

Criticisms

The lockerless school movement has been criticized in the area of cost effectiveness due to the cost of books and locker removal in the renovation process. Since schools are built to last life times, cost effectiveness has to be evaluated over decades. “Educational Facility planners attempt to develop buildings that represent in value and cost what taxpayers conceptualize as a ‘good buy’. This creates a facility that looks attractive, functions well, is initially affordable, and will have a reasonable operational and maintenance cost. In short the goal is to get the most for the money spent” (CEFPI, 1991, p. K2). Lockerless schools are extremely cost effective in new school construction. When lockers are not needed in the academic area, an estimated savings of 200-250 dollars per student can be saved. This saving is realized in unnecessary locker cost and square footage cost. Therefore, a school built for 1000 students can save a quarter of a million dollars. This money can be used for auxiliary space which is often considered a luxury. If no lockers exist then there is no need for locker repair, painting or cleaning. This is a costly process in money and time for all traditional schools. Schools seeking to convert to lockerless must spend funds to remove old lockers and renovate locker spaces. This removal and renovation process can take

place over a summer and cost will be recovered in a few short years. Finally, class sets of books must be purchased for the academic core courses. This expense is generally 13% of the total book cost in an average size school of 1000 students. The life of a book is 7-8 years; therefore, this entire cost is expanded out over many years and is very manageable for most schools. The state of Texas loses 5% of its textbooks annually according to Dr. Robert Leos, head of the textbook division at Texas Education Agency (TEA, 2003). Lockerless schools have a 2% book loss rate; this savings of 3% in replacement book cost over conventional schools will help pay for the classroom sets over a period of two years. Savings will be realized in the third through the eighth years of the books adoption period. Lockerless school textbooks are returned in perfect condition thus realizing another savings in damaged book replacement cost.

Whenever educators introduce a new concept concerning the use of the school facility, criticism will arise from the view of traditional standards. Most people attended schools with halls lined with lockers used for individual student storage. Therefore, the idea of a school without lockers raises concerns about students needing a place to store books, lunches, P.E. equipment, coats, paper, pens, notebooks, etc. These concerns are legitimate when considering that traditional schooling requires such supplies. In the traditional school with lockers, all student items went into one locker in the academic wing. In the new lockerless schools, these items are dispersed accordingly: home-personal textbooks; classroom- class set of textbooks; cafeteria refrigerator- sack lunches; carry or wear- cats, jackets; backpacks- paper, pens, notebooks. The organization

required by a lockerless school is much more complex than a traditional school with lockers.

Today many school student populations have out grown the intended capacity of the building. This overcrowding has caused schools to require students to share lockers. Two students using one locker makes the five minute passing period more challenging. To cope with the problem many students today have quit using their lockers and carry all their supplies in a backpack for the entire school day. This phenomenon of students abandoning their lockers for backpacks is also practiced in schools where the building size is so expansive that students do not have time to go to a locker when making the long trek between classes. These examples explain how the current problem of a heavy backpack is not directly related to lockerless schools. None-the-less a heavy backpack is a legitimate concern when considering back injury of young students. In Texas, “An increasing number of state legislators, school districts, and parents have expressed concern to the State Board of Education and Education Agency staff about school children experiencing back pain and the potential for injury as a result of carrying overloaded backpacks” (Alanis, 2002, p.1). The primary complaint concerns the weight of textbooks that are being carried in student backpacks.

The weight of textbooks and backpacks appears to be a concern in school districts throughout the United States, and bills have been introduced in several state legislatures to further define and address the problem. For example, in California, bill number AB2532 introduced in the state assembly in May 2002, states the following: Section 1. The legislature finds and declares all of the following:

- a. Backpacks of elementary and secondary school pupils often contain textbooks, binders, calculators, personal computers, lunches, change of clothes, sports equipment and more.
- b. Elementary and secondary school pupils are carrying backpacks weighing as much as 40 pounds.
- c. Chiropractors, physical therapists, and pediatricians are seeing an increasing number of children for spinal column injuries, non-traumatic back pain, and significant postural changes from overloaded backpacks.
- d. Chiropractors and pediatricians recommend that backpacks not exceed more than 15 percent of a pupil's body weight.
- e. In 1999, more than 3,400 pupil's between 5 & 14 years of age, inclusive, sought treatment in hospital emergency rooms for injuries related to backpacks or book bags according to the United State Consumer Product Safety Commission. (Alanis, 2002, p. 1-2)

This assault on the weight of textbooks has drawn the attention of the National Association of State Textbook Administrators (NASTA), the Book Manufacturers Institute (BMI), and the Association of American Publishers (AAP). These three organizations constitute an alliance known as The Advisory Committee on Textbook Specifications (ACTS). "In the winter of 2001, ACTS began investigating the cause and possible solution to the overweight backpack problem. After hearing from a variety of experts, it became clear that the overweight backpack problem is a result of children carrying most, if not all, of their textbooks, as well as a multitude of other items ranging from extra

clothing, make-up, lunch, and CD players in their backpacks all at the same time”

(Alanis, 2002, p.2).

The ACTS study concluded that there were two main reasons why school children today are carrying around heavy backpacks and both are related to lockers, rather than text books weight.

1. “For security and cost reasons, many schools have eliminated lockers. Students have little choice but to carry their textbooks and other possessions, not only to and from school, but also from class to class during the day.

2. Many schools that have lockers are so large that students do not have time to go to their lockers between classes without being tardy. One study by the American Physical Therapy Association found one-third of the students who have lockers do not use them. Therefore students must still carry textbooks for multiple classes with them during the day, and to and from home” (Alanis, 2002, p.2).

ACTS recommends, “providing all students with lockers and enough time between classes so they can use them. Lockers can cost \$150 each, however, and require considerable maintenance” (Alanis, 2002, p.3). Other possible courses of action recommended by ACTS for addressing the overweight backpack problem are: “reducing paperweight and allowing soft covers, dividing books into multiple volumes, purchasing classroom sets of textbooks while allowing students to keep their initial issue of books at home; and increasing the use of electronic textbooks” (Alanis, 2002, p.3).

According to Felipe Alanis, the commissioner of Education in Texas, the most effective way to address the problem of students carrying overweight backpacks is by the

individual school district purchasing classroom sets of textbooks. “Alanis said that until electronic delivery of instructional materials becomes practical affordable and widespread, a school district’s best option to lighten the student’s backpack load is choosing the extra textbooks- classroom set option. The students don’t have to carry their textbooks to or from school, nor even carry them from one classroom to the next or back to their lockers” (Clift, 2002, p.1). Alanis offers an example of how the classroom textbook option works. “If a school offers six math classes with an average of 30 students each. The school would provide 180 \$50 math books (one for each student) at a total cost of \$9,000 (free to the ISD if the book is on the state-adopted textbook list). The school would then buy 30 more textbooks to keep in the classroom. This increased cost of purchasing a classroom set is \$1,500 (or a 16% increase) over the original \$9,000 investment. But the districts cost would actually be lower, Alanis said, because the books would not be carried all day, which in turn would result in less wear and tear and fewer books lost” (Clift, 2002, p.1).

The lockerless school movement will continue to face criticism in regard to heavy backpacks due to carrying textbooks. Lockerless school administrators will have to wait years for electronic delivery of textbooks on CDROM or over the web. Consequently, textbook management and purchase will be one of the critical issue as to the success or failure of a school without lockers.

Shortcomings of Previous Studies

Educational research is inherently difficult. Investigating possible links between facility cost, student safety and achievement provides additional complexities. Controls

are difficult to acquire, and it is hard in an educational setting to assign teachers and students randomly or to have the funding necessary to randomly change the physical settings. There are additional problems in trying to match teaching methods, student abilities, and physical learning climates while conducting research. Much of educational research is conducted using surveys.

The previously cited studies utilized a variety of instruments and methods to study relationships and comparisons. Although it is assumed that the data collected by survey instruments is quantifiable, a study based on cross-sectional survey data is subject to source error. Respondents may not remember information related to previous time accurately. Such errors are likely to become larger as the researcher delves farther into the past. Further, some questions might require information or a knowledge set unavailable to the respondent. While answers are given with the best intentions, accuracy is difficult to check. In addition, although factual information may be recalled accurately, the respondents' answers. As a result, it is ill advised to generalize from a survey research study.

The researcher of facilities and student achievement must make conclusions that weigh the difficulties of control in educational research. Studies by Ayers, Anderson, Cash, and Hinks were based in part on survey results. In these cases on most facility studies there was a positive difference for students in the better buildings. These studies found that some of the most important factors that influenced learning are those that relate to control of the acoustics, thermal environment, proper illumination, adequate space, availability of equipment and furnishings, building condition and building age.

Survey research has long historical tradition as a method of systematic data collection, but relationship generalizations are seldom advised. Statistical procedures have made it possible for educators to investigate educational phenomena using surveys. Since facility adaptations, like lockerless schools are being made on the suggestions of this past research. It will be important to conduct further studies evaluating the effects of new more specific facility changes such as those mentioned in the brain learning research like daylight, floor and wall texture, ventilation of humidity, learning studios, school size, staff comfort, decentralized buildings, sustainability, learning style options, project space, and refuge areas.

Theoretical Framework

The cumulative body of study has shown that schools have an equal importance for our students, educators, and community. Historically schools used community facilities like churches and town halls to educate our children. As the importance of education grew in the U.S. so did individual school buildings. School facilities were built with little or no information concerning proper learning environments. School reformers like Henry Bernard, Horace Mann, John Davenport, Heinrick Pestalozze criticized the schools for being nothing more than shelters. As modern studies became available in the 1960s and 70s school facility planners paid more attention to their effect on occupants productivity. Their attempt to build better schools was supported by the massive population growth due to the baby boomers reaching school age. The Open School Concept was one of these new facility adaptations. Like the Quincy Box the open concept flourished, but as time went on its open spaces were carved back into more

appropriate boxes for the learning of the day. Perkins noted that: “In the 1960s one response was the open-plan school- a concept that involves the inclusion of large open spaces within the school. These large spaces were supposed to encourage flexible teaching, larger group teaching situations, another less traditional teaching approaches. Many teachers never committed to the concept, and the spaces themselves were often anonymous, unattractive, and hard to use. Now many of these earlier experiments with flexible design have been subdivided into traditional classrooms” (Perkins, 2001, p 98).

Today’s educators are faced with a different set of circumstances concerning facilities. Aging schools, high construction costs, a growing immigrant population, and student performance testing are all requiring schools to be built more cost efficient, safer, and with productive learning environments. Far too often the first concern of cost will determine the quality of safety and learning environment in the schools we build today. This is the reason why Texas District Judge John Dietz (2004) listed inadequate public school facilities as the primary failure of the state in his ruling against current school finance in Texas:

1. The amount of revenues is insufficient to meet the constitution’s requirement to provide ‘an adequate suitable education’.
2. The property tax system, under which an increasing number of districts ‘are forced’ to tax at the statutory cap of \$1.50 to meet standards, has effectively removed ‘all meaningful discretion’ from local authorities and become an unconstitutional state property tax. There fore, ruled Dietz, the system is ‘neither financially efficient nor efficient in... providing’ a constitutional

‘adequate’ education nor in meeting the requirements of other state laws.

(King, 2004, p 1)

The necessary funding can no longer be desired by state and local policy makers. Our schools must be maintained to meet the demands of educating today’s student population who are bilingual, immigrant, gifted, handicapped, multi-cultural, economically deprived, and technologically challenged. Jonathan Kozal (1991) writes about inadequate school faculties in his book *Savage Inequalities*. He states: “Even though the deterioration is well known and widely documented, many districts continue to defer the necessary funding because there are demands of higher priority on limited reasons”

The purpose of this study will be to compare the new learning environment of a lockerless school to school research on physical climate. This knowledge will help school administrators adopt policies that enhance and enrich their schools learning environment. This study is based on the principle that single pro-active change in the learning environment will eliminate the need for establishing reactive policies which can reduce the sustainability of the school building. Because lockerless schools are not customary; teacher, student, and parent training is a very important part in converting from a traditional school with lockers. The lockerless practices of academic enhancement requires extensive community public relations, student promotional programs, and staff development. These orientations and post occupancy evaluations are essential to the successful change to a lockerless school.

An educational facility must be congruent with ideas that are understood and supported by the users. A new environment alone will not impel change in behaviors that have developed through time and experience with other environments. If of course the users were involved in the initial planning stages and the design of the furniture reflects their preferences and intended usage, the problem is more than half resolved. If not simple orientation must become something more comprehensive, perhaps more like in-service training. (CEFPI, 1991, p. D2)

Lockerless campuses devote staff development time every year to the basics and the changes in their lockerless policy. Students are trained in academic organizational skills by their teachers daily. The efforts are coordinated by the administration to assure realization of campus and district goals. For over five years the lockerless movement has continued to adjust the policy to ensure the ultimate result of improved student achievement. “The physical environment has a direct impact on the educational process. A well-designed environment can help stimulate and support teaching, whereas a poorly designed school can inhibit learning” (Perkins, 2001, p 1).

In his book *Environments for Learning*, Jensen (2003) mentions corridors and lockers as being primary areas for future facility change. In the last chapter, The Total Environment, he stresses designing smart schools with no lockers and less corridors, thus creating schools that are more cost efficient, safer, and brain friendly learning environments:

Classrooms- Traditional classrooms will give way to multipurpose ‘learning studios’ or ‘zones’- places where children can engage in specialized task-specific activities together. ‘Learning Streets’ and atrium entranceways and sitting areas will replace nondescript, narrow corridors. Wider hallways without lockers reduce bullying, running, and discipline problems. Shorter, more socially compatible ‘cubbyholes’ will replace the standard maze of uniform lockers. An atrium lobby (supervised of course allows students to de-stress and write, draw, or reflect in creative ways between classes and before and after school. (p 44)

Decentralized Buildings with Multi-Age Opportunities- In addition to learning studios, innovative school environments have fewer corridors and more open areas both in and out of the classroom where social interaction is encouraged. Nowhere in our society is such strict age grouping found as in our schools. There is ample evidence that multi-age class groupings are developmentally better for children. This means providing better access between buildings and classrooms- profound structural variation from the norm. It has implications for decentralized solar heating, natural cooling, day lighting, space planning, aesthetics, resource sharing, community involvement, and accessibility. (p 45)

CHAPTER III

METHODOLOGY

Introduction

The research conducted in Washington, D.C., Chicago, Virginia, and across the U.S. has shown a strong correlation between the condition of the school facility and student achievement. A safe/secure, brain-friendly learning environment allows teachers to teach more effectively and improves student cognitive skills. All information gathered from the recent studies on quality learning environments has helped educators and school architects develop designs for 21st century schools that will make teaching and learning a quality experience for all students regardless of wealth, nationality, race, or handicap. The problem with providing quality school facilities is not that we don't understand the physical characteristics that nurture learning; the problem is paying for the renovation and construction of such schools. Therefore, any study conducted on facilities must include a cost efficiency review. In 1918, James L. McConaughy of Dartmouth University, wrote a statement that rings true today in the Texas State Legislature regarding financing public schools: "This is an age of efficiency. In the eye of the public no indictment of a school can be more severe than to say it is inefficient" (McConaughy, 1918).

Purpose

The purpose of this study will be to investigate in depth the facility adaptation of lockerless schools to determine if they provide a safe and secure, brain-friendly learning environment, which can be produced and operated cost-efficiently. It is important to

investigate the lockerless school movement by comparing its qualities of safety/security, learning environment, and cost efficiency to a traditional school with lockers. Therefore the following questions will be answered.

Research Questions

1. Are lockerless schools more cost efficient than traditional schools with lockers?
2. Do lockerless schools improve school security as opposed to traditional schools with lockers?
3. Do lockerless schools create a positive change in the learning environment as opposed to traditional schools with lockers?

Theory

This study is based on the theory that funds diverted from the antiquated technology and practice involving school lockers can benefit the total school environment by strengthening and simplifying security, thus improving the physical and psychological aspects of a school that affect the teaching and learning processes.

Research Methodology

Lockerless schools will be evaluated in the areas of security, learning environment, and cost efficiency. Learning environment and security data will be gathered from a faculty survey conducted in lockerless schools across the state. Survey criterion statement data will receive description from the comment section of the survey. Cost efficiency will be calculated by comparing related cost or savings involved with renovation, construction and operation of lockerless and locker schools.

Cost efficiency of a lockerless school will be determined through a cost comparison analysis of a lockerless school compared to a school with lockers. This analysis will compare the cost vs. savings of the following facility considerations:

For renovation or new construction:

- Square footage under locker
- Individual lockers installed
- Classroom book sets
- Remodeling of floors and walls
- Removal or repair of lockers
- Painting old lockers

For operations:

- Maintenance/Repair
- Custodial- summer cleaning and supplies
- Textbook replacement- theft/loss
- Textbook new adoption
- Security- lock repair
- Administration efficiency
- Custodial efficiency
- Campus security efficiency

This cost analysis will be compressed into a total cost-per-student for renovation, construction, and operation. As in any building project there will be a major cost difference between renovation and new construction. Operating cost should be the same

for a renovated or new school. From this cost analysis three categories of cost efficiency differences will be established between lockerless and locker schools.

1. Cost difference per student in new construction
2. Cost difference per student in renovation
3. Cost difference per student in operation

Information concerning security and learning environment will be gathered using a decision matrix survey. Faculty in lockerless schools will be selected randomly to participate in a decision matrix. Participant teachers will be selected by experience with both traditional schools with lockers and lockerless schools. Participants will assign selected Likert weights of effectiveness in regard to security and learning environment when considering criterion of the learning environments. An ordinal five point scale of effectiveness will be applied:

- 0- Non-applicable
- 1- Strongly Disagree
- 2- Disagree
- 3- Agree
- 4- Strongly Agree

There will be two categories of criterion, security and learning environment to be scored for their effect in a lockerless school vs. a locker school. A total score will be calculated for each criterion and each category. The dependent variable categories of security and learning environment will be listed horizontally across the top of the matrix. The independent variables are the criterion listed vertically along the side of the matrix.

(See Lockerless School Survey- Appendix A) This decision matrix will establish a scaled rating for effectiveness of lockerless schools in each criterion which can be considered by category for a security and learning environment score.

Using the descriptive statistic method of comparing means, the dependent variables of security and learning environment will be cross tabulated with the independent variables Likert rating. The inferential statistic analysis used to determine the statistical significance of the sample will be an independent t test comparing teacher and administrator survey responses. In quantitative research descriptive and inferential procedures are used to relate the data to the hypothesis. The findings will provide evidence to help us decide how our data relates to the theoretical framework that guides our research. (Nachmias, 2002, p. 20) Qualitative information will be gathered from the survey comment section, concerning the respondents' opinions on safety, security, and learning environment in their lockerless schools. These comments will add description to the statistical data of the survey statements. "Qualitative research is any type of research that produces findings not arrived at by statistical procedures or other means of quantification" (Strauss and Corbin,1998, p.11).

Research Design

This study will be designed to provide data driven quantitative information concerning lockerless schools. The first and primary concern when changing the learning environment through renovation or new construction of a lockerless school is cost/benefit. "Cost/benefit analysis enables planners to view various building designs or commodities in terms of benefits provided related to their cost. Its purpose is to identify

the alternative that possesses the best set of design features for the expense involved” (CEFPI, 1999, p K8). This cost/benefit analysis can be performed on a lockerless school by adding lockerless school design and commodities cost and subtracting lockerless schools savings of design and commodities. An example of design cost is renovation of an existing school corridor to remove lockers. Another example of commodities cost is purchasing textbooks for classroom sets. Examples of design and commodities savings are less building square footage needs and no individual student locker cost. These costs can be analyzed on a per student basis for a lockerless school in comparison to a school with lockers. The result will be expressed in monetary terms to establish an individual cost per student when building lockerless. Cost/benefit analysis will also be used to compare maintenance and operation cost. Over time lockers require maintenance, custodial services, and supervision, these cost are eliminated or lessened by the absence of lockers. Monetary savings will be expressed as a per student cost/benefit analysis for lockerless schools.

When considering operation cost it is important to calculate life-cycle and not just acquisition cost. An example is that additional textbooks for lockerless schools represent an additional acquisition cost, but a life-cycle savings must be placed on less lost and damaged texts due to lockerless school policy requiring no transport of textbooks. “To accurately figure the life-cycle cost of a facility, it is necessary not only to add up all experiences anticipated during the life of the building, but also to calculate the net present worth or the equivalent annual value of those expenses. Only by bringing all expenses to a common time and value can legitimate comparisons be made” (CEFPI, 1991, p K7).

This study will conduct cost/benefit analysis and life-cycle costing using data from Garland, Texas, a suburban school district that is considering building a lockerless high school. Cost can vary greatly between urban, suburban, and rural school building projects. Therefore, this study will use monetary data from a suburban district since suburbia represents the fastest growing student population of Texas.

The research data for determining safety/security and learning environment will be obtained from two surveys. The first will be the Lockerless School Matrix which will rank the categories of safety/security and learning environment and their individual criterion according to an ordinal scale. Only teachers from lockerless schools who have experience teaching in a locker school will be selected to complete the survey. It is important that the survey participants have experience in both schools, so they can rank the criterion listed under the categories of safety/security and learning environment. This survey will be distributed in rural, suburban, and urban lockerless schools. The researcher will attempt to obtain 150 to 200 completed surveys. From these surveys a scale of effectiveness for each criterion can be established. An example of the category Safety/Security on the criterion for occurrence of drugs in a lockerless school will receive a total ranking between not applicable – 0, to Strongly Agree- 4. (See Table A) The average score could possibly be 3.5 meaning that the lockerless school had a positive effect concerning the occurrence of drugs. Each criterion will be scaled to a percentage of the Likert rating given by the respondents. These percentages will be displayed by statement, sub-topic, and total category.

The second part of the survey will be comments gathered at the end of each category. This information will add description to the criterion statements. The comments will be grouped into themes for better elaboration of the criterion statement sub-topics of the survey.

Limitations

The strengths and limitations of this study primarily lie in three areas that tend to effect any study of an individual school program. First, every school is different in student population, ethnicity, economics, socio economics, staff, climate, culture, facility, etc. For this reason it is virtually impossible to exactly match any two schools. Consequently, this study will attempt to determine a differences in the before and after pictures of lockerless schools from urban, suburban, and rural campuses. The absence or presence of lockers is the only controllable variable.

Second, no two schools can ever identically implement the lockerless program. Schools put this program in place in order to fit their learning community. The lockerless school program has specific guidelines such as: classroom books sets and individual student stay at home book sets, backpacks or notebooks, class syllabus and student day planners, and technology adaptations. Each school implementing the policy might chose to vary a component in order to fit school climate issues, monetary restraints or present technology capabilities. An example is the use of student backpacks to transport textbooks. Some schools purchase class sets of textbooks, while others allow students to transport books. Transporting books is usually a fatal flaw in the implementation process of being lockerless, because it turns the students into a pack-mule resulting in parent

protest. The recommended procedure is to remove the lockers; however, there are schools that chose to not make the lockers available to students. Non-availability can work and is cost effect, but the presence of the lockers slows down the student conversion to the new form of academic organization.

Consequently, this study will focus on results in the areas of safety/security and learning environment. Regardless of the way the policy was implemented, the survey will substantiate whether security and learning environment conditions improved or did not improve. Only schools operating lockerless for three years will be chosen for this study thus assuring that the school surveyed has appropriately implemented the policy for their campus.

Third, the lockerless policy is a renovation or a new construction option. When comparing results of the program in a renovated school, one can easily witness the difference in the school when lockers were in place and when they were removed. When building a new lockerless school there is no appropriate comparison because it is not fair to compare a remodeled school to a new school. Some schools will have spent a tremendous amount of money to build a new lockerless school while others will have spent a minimal amount to remodel into a lockerless school. Therefore, this study survey will include a random sampling of all types of secondary lockerless schools. Many schools have adopted the lockerless policy for a short period of time and then gone back to lockers. This study will not investigate these schools, because the researcher is only interested in successful facility adaptations. The researcher is assuming that the policy implementation failed in the change process which can cause any innovation to fail.

Procedure

The cost analysis will start by establishing a price for building square footage, lockers, textbooks, and remodeling. These are cost that can vary by location of the building and vendor. Therefore, a set suburban location (Garland ISD) will be used, and one vendor will be chosen for product pricing. Maintenance/repair, custodial, security administration and loss can all change from one school district to another. These operation items cost will be calculated using (Garland ISD) expenses for a secondary campus. These numbers will be compressed into a per student cost for a school with lockers and a school without lockers.

Permission will be obtained from Garland ISD to use their cost for this study. The associate principal for Garland Lake View Centennial High School, Tod Nix, will assist in the analysis of all costs. The cost will be calculated for the 2005-2006 school year.

The Lockerless School Matrix will be completed by experienced teachers in secondary urban, suburban, and rural Texas lockerless schools. The individual survey respondents will remain anonymous to the researcher. Surveys will be sent to consenting schools with years of lockerless experience. The administrator of these schools will be asked to randomly select teachers who have experience in lockerless and locker schools to fill out the matrix. The surveys will be gathered by the administrator and mailed back to the researcher. The Lockerless School Matrix survey will take less than ten minutes to fill out. Postage will be provided and results will be returned to each participating school.

Participants and Organizations

The choice of a district to be studied should reflect renovation and construction patterns in Texas. Texas' student population in 2002 was over four million and growing. According to the Texas Public School Statistics produced in 2002, 75% of students go to schools in districts with more than 5,000 students. (TEA, 2001-2002, p 2) This statistic indicates that the majority of our school facility renovation and construction will be done in large urban and suburban school districts. For this reason, the cost analysis of the study will be conducted in Garland, a large suburban school district.

Garland is a suburb of Dallas that in 2006 has 21 secondary campuses for 39, 851 students. The district is 36.6% Anglo, 37.1% Hispanic, 18.6% African American, 7.7% other nationalities, and 39% economically disadvantaged. Its taxable value per pupil is \$181,106.00. This is below the state average of \$234,607.00. Garland's total revenue per pupil is \$5,943.00 compared to the state average of \$6,773.00. Fifty percent of Garland's funds are generated from state and federal revenue. (TEA, 2002, p 118) These statistics show Garland to be an average wealth district which must be concerned with cost efficiency.

The survey information from the Lockerless School Matrix and comment section will be obtained from ten to fifteen lockerless campuses. These secondary campuses will be urban, suburban and rural. All will have their own unique safety, security, and learning environment concerns. All will be different in their ethnicity, socio-economics, and budget. All will be similar in their quest to improve student achievement according to the Texas Assessment of Knowledge and Skills. This test sets the standard that binds

Texas educators together in a common goal for student achievement. Secondary schools are unique in that every student will test every year. Therefore, the environment for learning is important on a daily basis. Student welfare, attendance, comfort, organization, and learning spaces can all affect a secondary student's level of achievement. Consequently, no matter where a school in Texas is located, no matter who attends, and no matter the wealth, Texas students need the safest, most brain friendly learning environment that Texas can afford. This common achievement quest adds validity to all schools chosen for this study in regard to the sample set of schools.

Data Collection

Data collected to evaluate product cost will be selected through vendors and architects to match specifications that most schools in Texas would consider cost efficient. The individual locker cost estimate will be calculated for purchase and installation of one full length, one square foot locker. These lockers are the most commonly used in secondary schools, because they provide the most space and cause less congestion than stacking half-lockers.

New construction cost will be confirmed from the School Facility Division of TEA and Garland ISD. This cost estimate will be an average square footage cost to build in Texas based on today's building cost for an average secondary school.

Remodeling cost will be obtained from Garland ISD Maintenance & Facility Department. This type of calculation is estimated by demolition, renovation, and replacement cost. An exact cost is impossible because each job is unique. Therefore, this study will use Garland ISD 2005-2006 cost for estimating remodeling.

Textbook cost will be calculated by the current average cost per grade level. This cost will be transformed into total cost per secondary school and compressed into cost per student. Only new book pricing will be calculated for additional books needed for classroom sets and cost savings involved with lost book replacement. These book prices will be obtained from TEA's Textbook Division.

The operation cost involved in a secondary school will be obtained from Garland ISD. Cost for maintenance, repair, custodial, security, and administration will be calculated on a per student basis for operating a normal secondary school with lockers. This cost will then be adjusted for operating a lockerless secondary school accounting for the differences of these services without the presence of lockers.

All cost analysis will be confirmed using current pricing and estimates for the 2006 Annual Construction Report. This data will be obtained in the spring of 2006 from journals, architects, TEA, and Garland ISD. All calculations will be validated by experts at TEA (Gary Marek), Mars Architecture (Mike Mars), and Garland ISD (Todd Nix).

The Lockerless School Matrix survey will be distributed in the fall semester of 2006. Enough urban, suburban and rural secondary schools will be selected to obtain 150 to 200 teacher responses. The respondents will be chosen randomly from lockerless schools with three years operating experience. All respondents must have taught in a secondary school with lockers. Respondents will be randomly chosen by their principal and will remain anonymous to the researcher. The survey will take approximately ten minutes to complete. The administrator will be provided with enough surveys and

postage according to an interview conducted while searching for lockerless school campuses.

Each campus administrator will be provided with the total results of the survey and their individual results. This data should be valuable to the campus for evaluating their lockerless school policy.

Data Analysis

The cost analysis data will be presented as a simple comparison of cost per student for a locker campus versus cost per student for a lockerless campus. Charts will be produced showing how all cost involved (new construction, renovation, and operation) were converted into a per student cost. Cost comparison tables will be produced for each of these three areas as well as the total picture of new construction and operation and renovation. Computer generated tables, charts, and graphs will be used to illustrate these cost comparisons.

Data generated from the lockerless matrix ordinal ranking will be displayed in percentages of agreeing and disagreeing responses for each criterion statement, these percentages will be appropriately combined into sub-topics and then totaled for a complete category percentage score. For example, the criterion statement (i.e. less noise), will be given a percentage score for agreeing and disagreeing responses, then the sub-topic (i.e. school climate) will be given a percentage score based on the total scores of all the criterion statements in that sub-topic. This procedure will be conducted for all responses, teacher responses, and administrator responses. This sample group of lockerless schools will be ten to fifteen campuses, which should allow for a random

selection of 150 to 200 teacher respondents. Statement validity will be determined by selection of the not-applicable Likert rating. Any criterion statement receiving the not-applicable rating for over fifty percent of its total responses, will be considered not valid and the statement will be eliminated from the study. The researcher will rely on inferential statistics analysis of independent t test comparing teacher and administrator survey responses to determine significant variances for predictions about the lockerless school environment. All data will be analyzed using SPSS for Windows Statistic Program. Computer generated tables, charts and graphs will be used to illustrate the matrix survey percentage scores.

The comments gathered at the end of each category will be grouped into descriptive themes. This information will complement the criterion statement data. The words of the respondents will help to describe the findings of the survey.

Summary

The purpose of this study is to investigate the relationship between Texas lockerless schools for cost efficiency, safety/security, and learning environment. Chapter III describes the research methodology used for this three part study. First a cost efficiency analysis will determine a cost per student evaluation of lockerless schools vs. locker schools. Second, teachers and administrators will be surveyed using the Lockerless School Matrix, which requires them to rank their school's effectiveness concerning safety/security and learning environment. Third, comments will be solicited at the end of each category to further generate opinions concerning their campuses safety,

security, and learning environment. Chapter III describes the setting, research design, limitations, procedures, participants, and data collection/analysis.

CHAPTER IV

FINDINGS OF THE STUDY

Introduction

Almost two decades ago, the Carnegie Foundation for the Advancement of Teaching (CFAT) released a study that schools are under-funded, facilities are decaying, and faculty, as well as, student moral is low. (CFAT, 1998) Ten years later, John Sharp, a former Texas State Comptroller produced a publication titled *Current and Future Facilities: Needs of Texas Public School Districts*. This survey intended to question 1,037 Texas school superintendents about the conditions and problems of their facilities and projected needs for future facilities. The survey totaled the data from 614 responding superintendents who were primarily from urban districts of 50,000 students or more. The findings were that Texas Schools needed \$9 billion in facility improvements. This survey supported the previous legislation of 1997 creating Instructional Facilities Allotment (IFA) and encouraged 1999 legislation for Existing Debt Allotment (EDA). Currently IFA and EDA legislation still continue to support Texas public school building projects.

In 2006, Carole Strayhorn, the Texas Comptroller of State Accounts, in response to the recent Texas Supreme Court ruling on school finance released a survey calling for the similar information contained in the Sharp survey eight years earlier. Her School Facilities Survey is designed to provide the 80th Texas Legislatures starting in January of 2007 information on the current and future public school facility needs. This legislative session will have the opportunity to revamp school facility funding which was neglected in the special legislative session of 2006. Legislative action is necessary to address the

rapid growth in urban and suburban student population which spawn concerns about school security, learning environment, and cost efficiency.

To examine a relationship between the cost efficiency of a school facility and its ability to provide a safe and positive learning environment was the guiding purpose of the current study. This chapter contains a presentation of the information and survey findings for a study of Lockerless campuses in twelve Texas School districts. This study uses a mixed method approach. A cost/benefit and life-cycle analysis for new construction, renovation, and operation will be conducted using information from Garland ISD, TEA and architectural manuals. A survey of twelve lockerless secondary campuses will gather teacher and administrator opinion concerning their schools security and learning environment. The cost analysis and survey findings are based upon the following research questions:

1. Are lockerless schools more cost efficient than traditional schools with lockers?
2. Do lockerless schools improve school security as opposed to traditional schools with lockers?
3. Do lockerless schools create a positive change in the learning environment as opposed to traditional schools with lockers?

Cost/Benefit Analysis

Context of Construction, Renovation and Operation Cost

Since the majority of school construction will occur where student populations are growing, this study used the cost calculations for construction, renovation, and operations of Garland Texas, a rapidly growing school district in suburban Dallas. Garland's

twenty-one secondary campuses housed 39,851 students in the 2005-2006 school year. Of this count 12,762 attended middle schools and 15,732 attended high schools. Garland is the fourth largest school district in Dallas County and the thirteenth largest school district in Texas with over 55,000 pupils PK-12th grades. These students are of diverse ethnicity: 7.7% Asian and Native American, 18% African American, 37.1% Hispanic, and 36.6% Anglo. Garland gathers approximately 50% of its operating funds from state and federal revenue. These statistics indicate that Garland is a growing urban school district with diverse ethnicity, a high economically disadvantaged population, and average wealth. Garland has no secondary schools that are lockerless but are currently considering building a new lockerless high school.

Context of Cost Information for Construction, Renovation, and Operations

The 2006 cost associated with construction, renovation, and operation of a Garland ISD secondary school was obtained by Tod Nix, Associate Principal of Lake View Centennial High School in Garland Texas. He interviewed Danny Wilkins, Garland ISD Facility and Maintenance Director concerning the following topics:

1. new building square footage
2. new lockers
3. locker installation
4. lock repair
5. locker repair
6. locker painting
7. locker removal and demolition

- 8. wall and floor repair under lockers
- 9. frequency of locker repair
- 10. cleaning
- 11. cleaning supplies

These eleven topics are explained in greater detail in the following construction, renovation, and repair list. This list established costs based on a secondary campus of 1200 pupils with each student having a single full length locker. These costs per topic are displayed in two columns, Per Student Locker, and Per 1200 Student Campus. Descriptions of frequency and cost calculations are combined and explained where necessary.

Table A: Construction Renovation and Repair Cost Association with Secondary School Lockers in Garland ISD	Per Student Locker	Per 1200 Student Campus
1. New secondary school construction cost per sq. ft.	\$110	\$132,000
2. Secondary locker cost for a mid-priced full length locker with a one sq. ft. base.	\$200	\$240,000
3. Cost for installing one locker.	\$25	\$30,000
4. Lock repair cost is \$4.50 and annually (15%) of the districts locks (4,443) are repaired. This equates to 180 locks annually repaired for a campus of 1200 students costing \$810 total or \$.675 per locker.	\$ 0.675	\$810
5. Contractor charge to repair door and hardware for one locker.	\$7.95	\$9,540
6. Contractor charge to paint door and outside of one locker based on job minimum of 1000 lockers.	\$20	\$24,000
7. Cost to remove and demolish one locker.	\$5	\$6,000
8. Cost to repair student corridor wall and floor under one removed locker.	\$10	\$12,000
9. Annually 15% of the lockers are repaired per campus of 1200 students. Therefore campus cost is figured on 180 lockers annually repaired at a cost of \$7.95 each, totaling \$1,431 per campus or \$1.19 per locker.	\$1.19	\$1,431
10. Campus locker summer cleaning requires a six person crew for 5 days at \$80 a day.	\$2	\$2,400

11. Campus locker summer cleaning supplies cost \$100 or .0833 per locker.	\$0.0833	\$100
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Context for Cost Analysis of Textbooks, New Adoptions and Losses

The 2006 cost associated with textbooks were based on the Texas Education Agency price for a new book. TEA textbook prices were used for a consistent base price in this study even though they are higher than a used book supplier prices. Textbook prices fluctuate according to age of the book. This study's secondary school model calls for the purchase of twenty different texts with most having different adoption dates. Therefore, it is impossible to determine exact book cost due to number of courses requiring classroom sets, date of new textbook adoption and age of existing textbooks. For consistency, this study will use the highest textbook cost which is that of a new book purchased from TEA and will set the number of core courses requiring classroom sets at twenty. Cost are listed under four topics:

- 12. initial classroom set of books
- 13. annual new textbook adoptions
- 14. annual 5% lost textbooks with lockers
- 15. annual 2% lost textbooks for lockerless schools

These four topics are explained in greater detail by using three lists. The first list explains cost per student and campus for textbooks based on a four grade high school campus of 1200 students. The second list describes how costs were calculated for these four topics. The third list shows average cost of textbook calculations according to TEA

and sets the perimeters for a four year high school with twenty core courses requiring classroom textbook sets. The descriptions of frequency and cost calculations are combined, listed and explained below.

Table B: Textbooks Cost Associated with a Lockerless High School	Per Student Locker	Per 1200 Student Campus
12. Individual classroom set of books for a lockerless school	\$36.57	\$43,886.00
13. Annual new textbook adoptions for lockerless school	\$7.31	\$8,777.38
14. Annual 5% lost textbooks with lockers	\$13.58	\$16,056.00
15. Annual 2% lost textbooks with lockerless schools	\$5.35	\$6,420.00

Description of Calculations Associated with Textbook Cost in a Lockerless School

12. Initial cost calculation for a classroom set of books in a lockerless school

- 1200 student campus
- 300 students per 4 grades (9-12 campus)
- 25 students per class section
- 12 sections of subject class
- 2 teachers at 6 sections per teacher
- 25 books per teacher for class sets times 2 = 50 books
- 300 books for students to take home
- 350 books needed per subject
- State textbook allotment in 103%= 309 books
- Campus would purchase 41 books per each core subject for a text book cost increase of 13%.

- Average book cost is \$53.52 times 41 books needed in each core subject equals \$2,194.32
- Five core subjects per grade times \$2,194.32 = \$10,971.00
- Four grade levels of core subjects times \$10,971.00 = \$43,886.00
- \$43,886.00 total campus cost divided by 1200 students = \$36.57
- \$36.57 is the initial cost per students to start a lockerless campus
- \$43,886.00 is the initial cost per campus of 1200 students

13. Annual textbook cost for new adoptions

- Average of one new core textbook adopted annually per grade level
- One adoption needs 41 books costing \$2,194.32 times 4 grades = \$8,777.28
- \$8,777.28 is annual campus cost divided by 1200 students = \$7.31
- \$7.31 is the annual cost per student to operate a lockerless campus
- \$8,777.28 is the annual cost per campus of 1200 students

14. Annual cost of a school with lockers that loses 5% of its textbooks

- \$53.52 average book cost times five student books equals a cost of \$267.60 per student
- \$267.60 student textbook expense at a 5% loss is \$13.38 loss per student
- \$13.38 is 5% loss per student times 1200 students = \$16,056.00

15. Annual cost of a lockerless school that loses 2% of its textbooks

- \$53.52 average book cost times five student books equals a cost of \$267.60 per student
- \$267.60 student textbook expense at a 2% loss is \$5.35 loss per student

- \$5.35 is 2% loss per student times 1200 students = \$6,420.60

Table C: Texas Education Agency 2006 New Book Cost for Secondary Schools

	Mathematics	Science	Social Studies	English	Literature/Language	Totals
6 th	\$42.00	\$54.50	\$53.25	\$40.75	\$50.50	
7 th	\$42.00	\$54.50	\$55.50	\$45.00	\$52.25	
8 th	\$42.00	\$54.50	\$55.50	\$43.25	\$52.25	
9 th	\$42.00	\$59.50	\$60.25	\$48.00	\$51.00	
10 th	\$42.00	\$62.50	\$61.00	\$48.00	\$51.00	
11 th	\$45.00	\$55.90	\$60.00	\$49.75	\$52.25	
12 th	\$61.50	\$59.00	(2)\$125.25	\$49.75	\$52.25	
Total	\$316.50	\$400.40	\$470.75	\$324.50	\$361.00	\$1,873.15
Average Cost	\$45.21	\$57.20	\$67.25	\$46.36	\$51.57	\$53.52

Table D: Texas Four Year High School Recommended Graduation Plan

Freshman*	Sophomore	Junior	Senior
English I*	English II*	English III*	English IV*
Algebra I*	Geometry*	Algebra II*	Pre Calculus*
Biology I*	Chemistry*	Physics*	AP Science Elective*
World *Geography	World History*	US History*	Gov. */ Eco. *
PE or Athletics	PE or Athletics	Speech	Elective
Health/CI*	Spanish I*	Spanish II*	Technology
Technology	Fine Arts	Elective	Elective

* Indicates core classes that require classroom textbook sets

Cost/Benefit Analysis Tables

The results of cost associated with lockerless schools have to express cost/benefit analysis. Table E compares new school construction for a 1200 student secondary school campus with lockers to one without lockers. Table F compares cost to renovate lockers in a 1200 student secondary school campus versus renovating to a lockerless school. Table G compares annual cost to operate a 1200 student secondary school campus with lockers versus lockerless. These three tables explain cost/benefit analysis based on original cost to purchase goods and services, as well as life-cycle costing.

New Construction Analysis

Table E: New Construction Cost/Benefit Analysis for a Campus with 1200 Students/Lockers vs. Lockerless:

	New School Constructed With Lockers		New School Constructed Lockerless	
	Per Student (Locker)	Per Campus	Per Student	Per Campus
1. Sq. Ft. Under Locker	\$110	\$132,000	\$0	\$0
2. Locker Cost	\$200	\$240,000	\$0	\$0
3. Locker Installation	\$25	\$30,000	\$0	\$0
12. Classroom Set of Books	\$0	\$0	\$36.57	\$43,886
Total Cost	\$335	\$402,000	\$36.57	\$43,886

Cost/Benefit for New Construction:

	Per Student Cost	Per Campus Cost
	\$335 total locker cost	\$402,000
	-\$36.57 total book cost (lockerless)	-\$43,886
Initial Cost Savings for Lockerless	\$298.57	\$358,114

Cost/Benefit in New Construction of Square Footage is Diverted into Other Facilities

Per Student Cost	Per Campus Cost
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	\$225 lockers and installation	\$270,000
	-\$36.57 total book cost (lockerless)	-\$43,886
Initial Cost Savings for Lockerless	\$188.43	\$226,114

Cost/Benefit for Total Lockerless High School of 1425 pupils:

	Per Student Savings	# of Students	Total Savings	Cost of School	Total % Saved
Saving Sq. Ft. Cost	\$298.57	X 1425	= \$425,426.25	/ \$19,855,000	2.14%
Not Saving Sq. Ft. Cost	\$188.43	X 1425	= \$268,512.75	/ \$19,855,000	1.35%

Analysis of Table E: New Construction

When building a school with lockers, there is a cost of \$335 per student/locker for square footage, locker purchase, and installation. This cost for a campus of 1200 students totals \$402,000. If the square footage under space or added as a different facility usage (i.e. auditorium space, parking, commons, library, etc.), the student/locker cost drops to \$225, and campus cost is \$270,000. Both these new construction cost have to be adjusted for book purchases which stays constant regardless of usage of square footage. This cost is \$36.57 per student or \$43,866 per campus of 1200 students.

When subtracting classroom book set cost (\$36.57) from total new locker construction cost (\$335), the cost/benefit analysis of Table E shows a savings of \$298.57 per student and \$358,114 per campus. If locker square footage cost is not totaled into

new construction, the cost/benefit analysis of Table E shows a savings of \$188.43 per student and \$226,114 per campus.

According to the school Planning and Management 2006 11th Annual Construction Report, the median size Texas high school of 1425 students will have 180,500 sq. ft. of instructional space. (Abromson, 2006, p. C15) This square footage requirement will not change with the subtraction or addition of 225 students because of building requirements and expansion capabilities required when building a new high school. Therefore, a 1425 pupil high school will have 180,500 sq. ft. of instructional space and will cost \$110/sq. ft. resulting in a total cost of \$ 19,855,000. If this school is built lockerless, \$425,462.25 could be saved representing a .0214 total project saving. If this same school is built and the locker square footage is diverted into other facilities, \$268,512.25 is saved representing a .0135 total project savings.

Renovation Cost/Benefit Analysis

Table F: Renovation Cost/Benefit Analysis for a Campus with 1200 Students/Lockers vs. Lockerless

	School Renovation With Lockers		School Renovation Lockerless	
	Per Student (Locker)	Per Campus	Per Student	Per Campus
8. Repair Corridor	\$0	\$0	\$10	\$12,000
7. Removal of Lockers	\$0	\$0	\$5	\$6,000
5. Repair Broken Lockers	\$7.95	\$9,540	\$0	\$0
6. Paint Old Lockers	\$20	\$24,000	\$0	\$0
12. Classroom Books	\$0	\$0	\$36.57	\$43,886
4. Lock Repair	\$0.675	\$810	\$0	\$0
Total Cost	\$28.63	\$34,350	\$51.57	\$61,886

Cost/Benefit Involved in Renovating to a Lockerless School:

	Per Student Cost	Per Campus Cost
	\$51.57 lockerless total cost	\$61,886
	-\$28.65 with lockers total cost	-\$34,350
Initial Cost Increase for Lockerless	\$22.94	\$27,516

Analysis of Table F: Renovation

When renovating a school with lockers there is a cost of \$28.63 per student/locker for repairing and painting. This cost for a campus of 1200 students is \$34,350. If renovating to a lockerless school, the cost is \$52.54 per student/locker for corridor repair, locker removal, and classroom sets of textbooks. This cost for a campus of 1200 students is \$61,886.

When subtracting total locker repair per student cost (\$28.63) from lockerless renovation, total cost (\$51.57), the cost/benefit analysis for Table F shows an increase of \$22.94 per student/locker for renovating to lockerless school and an increase of \$27,516 per campus.

Operation Life-Cycle Cost Analysis

Table G: Operation Life-Cycle Cost Analysis for a Campus with 1200 Students/Lockers vs. Lockerless

	Annual Operation With Lockers		Annual Operation Lockerless	
	Per Student (Locker)	Per Campus	Per Student	Per Campus
4. Annual Lock Repair	\$0.0675	\$810	\$0	\$0
9. Annual Locker Repair	\$1.19	\$1,431	\$0	\$0
10. Summer Cleaning	\$2.00	\$2,400	\$0	\$0

11. Summer Cleaning Supplies	\$0.0833	\$100	\$0	\$0
14. 5% Lost Textbooks (lockers)	\$13.38	\$16,056	\$0	\$0
15. 2% Lost Textbooks (lockerless)	\$0	\$0	\$5.35	\$6,420.00
13. New Textbook Adoption	\$0	\$0	\$7.31	\$8,777.38
Total Cost	\$17.35	\$20,797.00	\$12.66	\$15,197.38

Analysis of Table G: Operation

When operating a school with lockers, the annual life-cycle cost is \$17.35 per student/locker for repairs, cleaning, and lost text books. Cost for a campus of 1200 students is \$20,797. If operating a lockerless school, the annual life-cycle cost is \$12.66 per student/locker for new textbook adoptions and lost textbooks. This annual cost for a campus is \$15,197.38.

When subtracting the lockerless annual life-cycle cost (\$12.66) from the locker school annual life-cycle cost (\$17.33), the annual savings for life-cycle is \$4.67 per student and \$5,599.62 per campus of 1200 students.

Twenty Year Life-Cycle Analysis

In Table G, an annual life-cycle savings of \$4.67 per student and \$5,599.62 per campus is realized for a lockerless school. These savings can accumulate during the life-cycle of the campus. To determine accumulated life-cycle savings for a lockerless school, the annual campus savings will be multiplied by the life-cycle of lockers before total renovation is required. Electrocoat, one of the major locker repair companies, determines the life-cycle to be twenty operating years.

Annual life-cycle savings		Years of no lockers		20yr new lockerless campus savings
\$5,599.64	X	20	=	\$111,992.80

A new lockerless campus would realize a life-cycle savings of \$111,992 over twenty years. A campus renovated to lockerless would realize this same 20 year saving minus the initial cost of renovation (\$27,516).

20 Year Savings		Lockerless Renovation Increase		15 Year Renovated Lockerless Campus Savings
\$111,992.80	-	\$27,516.00	=	\$84,476.80

A new lockerless campus entails saving \$5,599.64 annually over 20 years. A renovated lockerless campus will not realize savings until late in its fifth year of operation when the initial cost increase of \$27,516 is paid back by annual life-cycle savings.

Annual life-cycle savings		Years of no lockers		5 year lockerless campus savings
\$5,599.64	X	5	=	\$27,998.20

Consequently in years 6-20 a renovated lockerless school starts realizing the full annual savings (\$5,599.64) for 15 years.

Other Cost Efficiencies Associated with Lockerless Schools

According to Garland ISD facility and maintenance director, Danny Wilkins, administrators, custodians, and security officers have many problems and extra jobs associated with lockers. When these jobs or problems are eliminated, an efficiency benefit can occur.

Administrators have to deal with problems associated with lockers. These problems can occur daily and are time consuming. Examples of these problems are: broken lockers, forgotten combinations, item theft, contraband in lockers, switching lockers, locker vandalism, over- stuffing lockers, locker clean out, abandoned lockers, and locker sharing. In a school without lockers, the assistant administrator will have none of these problems and will have the help of the teachers for managing classroom and student textbooks.

The administrator in a lockerless school will have to deal with backpacks or notebooks which will take the place of lockers. These personal storage items are currently being used by students in a school with lockers and generate fewer problems than lockers. Consequently, the secondary school administrator should have more time to devote to other jobs thus creating an efficiency benefit.

Campus custodians in secondary schools have a great deal of jobs associated with lockers. These jobs occur daily and are time consuming. Examples of these jobs are: dirty lockers, locker graffiti, locker overflow, food in lockers, locker maintenance, locker pest control, and locker top dusting. In a lockerless school, the custodians will have none of these jobs and will not have to gather lost and forgotten textbooks. Consequently, the campus custodian will have more time for cleaning other areas such as classrooms, commons, restrooms, offices, and libraries thus creating an efficiency benefit.

Campus safety and security personnel have a great deal of problems associated with lockers. These problems can occur daily and are time consuming. Examples of these problems are locker theft, locker vandalism, locker contraband, locker drug

searches, lockers blocking line of sight, and lockers obstructing egress. In a lockerless campuses, school resource officers will not have any of these problems and will have 1200 less hiding places to search during a bomb or gun threat. These officers also know that if they catch a student with contraband in their backpack or purse, there is a better chance of legal prosecution of a minor in possession. School resource officers in a lockerless campus have more time to: teach classes, monitor student traffic, secure buildings, inspect safety requirements, and prevent truancy, thus creating an efficiency benefit.

The efficiency benefits to administrators, custodial staff, and security staff will not result in a reduction in staff. Cost/benefit savings will be realized through better job efficiency due to the elimination of problems and jobs associated with lockers. Lockerless schools do not generate additional work. Consequently there is a net efficiency savings realized to administrators, custodial staff, and security officers. This savings is impossible to price but can be realized in personal efficiency.

Survey Results

The Surveyed Campuses

Seven hundred and ninety eight surveys were sent to twelve lockerless campuses in Texas. Two hundred and thirty nine surveys were returned fully or partially completed. Two hundred and seventeen were completed by teachers and twenty - two by campus administrators. The campuses surveyed consisted of five high schools, five junior high or middle schools, one 9th and 10th grade center and one 6-12 secondary campus. The enrollment range of these campuses are from 1938 to 280 students. Ten

campuses were rated Academically Acceptable and two were rated Recognized for the Texas Accountability rating system of 2005. Six of the campuses have over 50% economically disadvantaged student populations, three have 40%, and three have under 26%. Seven of the campuses pupil ethnicity is majority minority students and five are majority anglo students. Eight of the campuses were new construction with no lockers. These new lockerless campuses range in age from six years old to one year old. Four of the campuses were renovated to a lockerless campus and have been operating as such from eight years to three years. The location of these campuses are: five in the Austin area, five in the Victoria area, and two in the Dallas area. Eight of the campuses are in rural school districts, two are in urban school districts, and two are in a suburban school district. Each of these school's data can be seen in Table H.

TABLE H: Surveyed Campuses Descriptive Data

Campus	Surveys Returned	Enrolment	Rating	Economic Distribution	Ethnicity	New Construction/ Renovation	Area	District Type
Birdville H.S	18	1938	Acc.	22%	Maj. Anglo	New 6 yrs	Dallas	Sub.
Cuero Jr. H.S	6	463	Acc.	56%	Maj. Min.	New 5 yrs	Victoria	Rural
Cuero H.S	21	692	Acc.	40%	Maj. Anglo	New 1 yrs	Victoria	Rural
Florence H.S	6	326	Acc.	40%	Maj. Anglo	New 4 yrs	Austin	Rural
Granger 6-12	24	280	Acc.	50%	Maj. Anglo	Ren. 7 yrs	Austin	Rural
Hays H.S	57	1908	Acc.	26%	Maj. Min.	New 3 yrs	Austin	Sub.
Lockhart Jr. H.S	10	1010	Acc.	51%	Maj. Min.	New 5 yrs	Austin	Rural
Patti Welder M.S	25	1038	Acc.	68%	Maj. Min.	Ren. 8 yrs	Victoria	Urban
Taylor M.S	10	663	Acc.	59%	Maj. Min.	New 4 yrs	Austin	Rural
Stroman 9-10	23	1880	Acc.	40%	Maj. Min.	Ren. 3 yrs	Victoria	Urban
Van Alstyne H.S	30	401	Rec.	10%	Maj. Anglo	New 3 yrs	Dallas	Rural
Yoakum Jr. H.S	9	339	Rec.	56%	Maj. Min.	Ren. 5 yrs	Victoria	Rural

The Survey Criterion Statements

The survey consisted of 32 criterion statements divided into two categories; Safety and Security has 18 statements and Learning Environment has 14 statements. All

respondents were asked to rate their campus in regard to each statement using the following Likert Scale: Not Applicable, Strongly Disagree, Disagree, Agree, Strongly Agree. At the end of each category a comment section was provided.

In the fall semester of 2006 each campus was provided surveys for all teachers and administrators. Responses were gathered from volunteering teachers and administrators who had experience teaching in both lockerless and traditional locker campuses. For each campus an administrator issued, collected, and returned the surveys.

Survey Analysis

The survey's descriptive statistics are displayed in three columns, Administrator, Teacher, and All (the combination of administrators and teachers). The response ratings are combined and grouped into two rows; strongly disagree/disagree and agree/strongly agree. The not applicable ratings were used only to determine statement validity; therefore, this data is not included in the teacher and administrator response analysis. The All statements were considered valid and given validity percentage rating extent to which administrators and teachers agreed or disagreed are the valid responses. These responses are presented by number and percentage of the combined responses: to strongly disagree/disagree or agree/strongly agree. The following codes will be used in the tables to display responses for each question.

Table I: Survey Rating and Respondent Codes

SD/D- represents combined responses for strongly disagree and disagree

A/SA- represents combined responses for agree and strongly agree

N:A- represents number of valid administrator responses

:%A- represents percent of valid administrator responses

N:T- represents number of valid teacher responses

:%T- represents percent of valid teacher responses

N:All- represents number of All valid responses

:%All- represents percent of All valid responses

The survey results for teachers and administrators were compared using an independent t test. Statistical significance is difficult to determine when the sampled population is small. In this study, the administrators sample population was only 22, in comparison to the teachers sample population of 217. In the comparison of means for teachers and administrators, the independent t test results show a statistical significance at the $p < .05$ level for ten survey questions (1, 3, 4, 14, 18, 20, 21, 23, 24, 27). The Comparison of Means (Table AA) and Independent t Sample Results (Table AB) are displayed in Appendix C. The ten statements that proved to have a statistical significance will have their significance level indicated in the analysis.

Safety and Security Criterion Statements Results

The safety and security statement of the survey have been grouped into the following sub-topics:

Table J: Safety/Security Sub-topics (an underline indicates a statistical significance)

School Contraband- statements 1, 2, 3, & 14

Campus Violence- statements 9, 10, & 11

Student Textbooks- statements 6 & 7

Student Concerns- statements 4, 5, & 8

Corridor Monitoring and Egress- statements 12, 13, 16, 17, & 18

Student Backpacks- statement 15

Total Category Analysis Safety/Security

These sub-topics all influence the status of safety, security, and discipline on a secondary school campus. Survey data for the safety and security criterion statements will be reported by individual statement analysis, sub-topic combined analysis, and complete category analysis.

Sub-topic: School Contraband

Statement 1: “My school has a lower occurrence of drugs than it did with lockers.”

Statement 1 has an 88.6% validity rating, and a significant variance of 0.000.

Of the 211 responses to lockerless schools having a lower occurrence of drugs, 67.3% agreed and 32.7% disagreed. Of the 190 teachers responding, 64.2% agreed and 35.8% disagreed. Of the 21 administrators responding, 95.2% agreed and 4.8% disagreed. An analysis of the results is located in Table 1.

Table 1: Lower Occurrence of Drugs

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	4.8	68	35.8	69	32.7
A/SA	20	95.2	122	64.2	142	67.3
Totals	21	100	190	100	211	100

Statement 2: “My school has a lower occurrence of weapons without lockers than it did with lockers.”

Statement 2 has an 87% validity rating

Of the 212 responses to lockerless schools having a lower occurrence of weapons, 76.9% agreed and 23.1% disagreed. Of the 192 teachers responding, 75.5% agreed and 24.5% disagreed. Of the 20 administrators responding, 90% agreed and 10% disagreed. An analysis of the results is located in Table 2.

Table 2: Lower Occurrence of Weapons

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	2	10	47	24.5	49	23.1
A/SA	18	90	145	75.5	163	76.9
Totals	20	100	192	100	212	100

Statement 3: “My school has a lower occurrence of contraband (pornography, tobacco, alcohol) without lockers than it did with lockers.”

Statement 3 has an 89.5% validity rating, and a significant variance of 0.000.

Of the 212 responses to lockerless schools having a lower occurrence of contraband, 73.1% agreed and 26.9% disagreed. Of the 192 teachers responding, 70.8% agreed and 29.2% disagreed. Of the 20 administrators responding, 95% agreed and 5% disagreed. An analysis of the results is located in Table 3.

Table 3: Lower Occurrence of Contraband

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	5	56	29.2	57	26.9
A/SA	19	95	136	70.8	155	73.1
Totals	20	100	192	100	212	100

Statement 14: “Conducting a drug search is easier in a school without lockers than in a school with lockers.”

Statement 14 has a 93.2% validity rating, and a significant variance of 0.000.

Of the 219 responses to lockerless schools having being easier to conduct drug searches, 83.6% agreed and 16.4% disagreed. Of the 192 teachers responding, 81.8% agreed and 18.2% disagreed. Of the 21 administrators responding, 100% agreed and 0% disagreed. An analysis of the results is located in Table 14.

Table 14: Ease of Drug Search

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	0	0	36	18.2	36	16.4
A/SA	21	100	162	81.8	183	83.6
Totals	21	100	198	100	219	100

Sub-topic Analysis for School Contraband (Statements 1, 2, 3, & 14)

Of the 854 combined responses regarding a lockerless school improving campus security in the area of school contraband 75.3% agreed and 24.7% disagreed. Of the 772 combined teacher responses 73.2% agreed and 26.8% disagreed. Of the 82 administrator responses 95.1% agreed and 4.9% disagreed. An analysis of the results is located in Table K.

Table K: Combined Data for School Contraband

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	4	4.9	207	26.8	211	24.7
A/SA	78	95.1	565	73.2	643	75.3
Totals	82	100	772	100	854	100

Sub-topic: Campus Violence

Statement 9: “My school has a lower occurrence of student fights without lockers than it did with lockers.”

Statement 9 has an 86.9% validity rating.

Of the 207 responses to lockerless schools having a lower occurrence of student fights, 61.8% agreed and 38.2% disagreed. Of the 187 teachers responding, 60.4% agreed and 39.6% disagreed. Of the 20 administrators responding, 75% agreed and 25% disagreed. An analysis of the results is located in Table 9.

Table 9: Lower Occurrence of Student Fights

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	5	25	74	39.6	79	38.2
A/SA	15	75	113	60.4	128	61.8
Totals	20	100	187	100	207	100

Statement 10: “My school has a lower occurrence of student conflicts during passing period without lockers than it did with lockers.”

Statement 10 has a 92.5% validity rating.

Of the 221 responses to lockerless schools having a lower occurrence of student conflict, 67.9% agreed and 32.1% disagreed. Of the 200 teachers responding, 66.5% agreed and 33.5% disagreed. Of the 21 administrators responding, 81% agreed and 19% disagreed. An analysis of the results is located in Table 10.

Table 10: Lower Occurrence of Student Conflict

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	4	19	67	33.5	71	32.1
A/SA	17	81	133	66.5	150	67.9
Totals	21	100	200	100	221	100

Statement 11: “My school has a lower occurrence of student bullying in the hallways without lockers than it did with lockers.”

Statement 11 has an 87.8% validity rating.

Of the 209 responses to lockerless schools having a lower occurrence of bullying, 57.9% agreed and 42.1% disagreed. Of the 190 teachers responding, 57.4% agreed and 42.6% disagreed. Of the 19 administrators responding, 63.2% agreed and 36.8% disagreed. An analysis of the results is located in Table 11.

Table 11: Lower Occurrence of Bullying

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	7	36.8	81	42.6	88	42.1
A/SA	12	63.2	109	57.4	121	57.9
Totals	19	100	190	100	209	100

Sub-topic Analysis for Campus Violence (Statements 9, 10, & 11):

Of the 637 combined responses concerning a lockerless school lowering the occurrence of violence, 62.6% agreed and 37.4% disagreed. Of the 577 combined teacher responses 61.5% agreed and 38.5% disagreed. Of the 60 combined administrator responses 73.4% agreed and 26.6% disagreed. An analysis of the results is located in Table L.

Table L: Combined Data for Campus Violence

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	16	26.6	222	38.5	238	37.4
A/SA	44	73.4	355	61.5	399	62.6
Totals	60	100	577	100	637	100

Sub-topic: Student Textbooks

Statement 6: “My school has a lower occurrence of lost textbooks without lockers than it did with lockers.”

Statement 6 has a 91.2% validity rating.

Of the 217 responses to lockerless schools having a lower occurrence of lost textbooks, 65.9% agreed and 34.1% disagreed. Of the 198 teachers responding, 65.2% agreed and 34.8% disagreed. Of the 19 administrators responding, 73.7% agreed and 26.3% disagreed. An analysis of the results is located in Table 6.

Table 6: Lower Occurrence of Lost Textbooks

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	5	26.3	69	34.8	74	34.1
A/SA	14	73.7	127	65.2	143	65.9
Totals	19	100	198	100	217	100

Statement 7: “My school has a lower occurrence of damaged textbooks without lockers than it did with lockers.”

Statement 7 has a 90.3% validity rating.

Of the 215 responses to lockerless schools having a lower occurrence of damaged textbooks, 64.7% agreed and 35.3% disagreed. Of the 196 teachers responding, 64.3% agreed and 35.7% disagreed. Of the 19 administrators responding, 68.4% agreed and 31.6% disagreed. An analysis of the results is located in Table 7.

Table 7: Lower Occurrence of Damaged Textbooks

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	6	31.6	70	35.7	76	35.3
A/SA	13	68.4	126	64.3	139	64.7
Totals	19	100	196	100	215	100

Sub-topic Analysis for Student Textbooks (Statements 6, & 7):

Of the 432 combined responses concerning a lockerless school lowering the number of lost and damaged textbooks, 65.3% agreed and 34.7% disagreed. Of the 394 combined

teacher responses 64.7% agreed and 35.3% disagreed. Of the 38 combined administrator responses 71.1% agreed and 28.9% disagreed. An analysis of the results is located in Table M.

Table M: Combined Data for Student Textbooks

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	11	28.9	139	35.3	150	34.7
A/SA	27	71.1	255	64.7	282	65.3
Totals	38	100	394	100	432	100

Sub-topic: Student Concerns

Statement 4: “My school has a lower occurrence of theft regarding personal student property without lockers than it did with lockers.”

Statement 4 has a 93.3% validity rating, and a significant variance of 0.027.

Of the 223 responses to lockerless schools having a lower occurrence of student property theft, 67.7% agreed and 32.3% disagreed. Of the 202 teachers responding, 65.8% agreed and 34.2% disagreed. Of the 21 administrators responding, 85.7% agreed and 14.3% disagreed. An analysis of the results is located in Table 4.

Table 4: Lower Occurrence of Student Property Theft

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	3	14.3	69	34.2	72	32.3
A/SA	18	85.7	133	65.8	151	67.7
Totals	21	100	202	100	223	100

Statement 5: “My school has a lower occurrence of tardy students without lockers than it did with lockers.”

Statement 5 has a 94.9% validity rating.

Of the 225 responses to lockerless schools having a lower occurrence of tardy students, 62.7% agreed and 37.3% disagreed. Of the 205 teachers responding, 63.4% agreed and 36.6% disagreed. Of the 20 administrators responding, 55% agreed and 45% disagreed. An analysis of the results is located in Table 5.

Table 5: Lower Occurrence of Tardy Students

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	9	45	75	36.6	84	37.3
A/SA	11	55	130	63.4	141	62.7
Totals	20	100	205	100	225	100

Statement 8: “My school has a lower occurrence of lost student personal property without lockers than it did with lockers.”

Statement 8 has a 92.8% validity rating.

Of the 221 responses to lockerless schools having a lower occurrence of lost student personal property, 69.7% agreed and 30.3% disagreed. Of the 201 teachers responding, 69.2% agreed and 30.8% disagreed. Of the 20 administrators responding, 75% agreed and 25% disagreed. An analysis of the results is located in Table 8.

Table 8: Lower Occurrence of Lost Student Personal Property

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	5	25	62	30.8	67	30.3
A/SA	15	75	139	69.2	154	69.7
Totals	20	100	201	100	221	100

Sub-topic Analysis for Student Concerns (Statements 4, 5, & 8):

Of the 669 combined responses concerning a lockerless school improving student concerns toward theft, tardies, and lost items, 66.7% agreed and 33.3% disagreed. Of the

608 combined teacher responses 66.1% agreed and 33.9% disagreed. Of the 61 combined administrator responses 72.1% agreed and 27.9% disagreed. An analysis of the results is located in Table N.

Table N: Combined Data for Student Concerns

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	17	27.9	206	33.9	223	33.3
A/SA	44	72.1	402	66.1	446	66.7
Totals	61	100	608	100	669	100

Sub-topic: Corridor Monitoring and Egress

Statement 12: “During the passing period, there is easier student movement in the halls without lockers than with lockers.”

Statement 12 has a 99.6% validity rating.

Of the 234 responses to lockerless schools providing easier student hall movement, 91.9% agreed and 8.1% disagreed. Of the 212 teachers responding, 91.5% agreed and 8.5% disagreed. Of the 22 administrators responding, 95.5% agreed and 4.5% disagreed. An analysis of the results is located in Table 12.

Table 12: Easier Student Hall Movement

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	4.5	18	8.5	19	8.1
A/SA	21	95.5	194	91.5	215	91.9
Totals	22	100	212	100	234	100

Statement 13: “When conducting safety drills your school evacuates quicker without lockers than with lockers.”

Statement 13 has an 84.7% validity rating.

Of the 200 responses to lockerless schools providing quicker evacuation, 78.5% agreed and 21.5% disagreed. Of the 180 teachers responding, 77.8% agreed and 22.2% disagreed. Of the 20 administrators responding, 85% agreed and 15% disagreed. An analysis of the results is located in Table 13.

Table 13: Providing Quicker Evacuation

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	3	15	40	22.2	43	21.5
A/SA	17	85	140	77.8	157	78.5
Totals	20	100	180	100	200	100

Statement 16: “My student hallways are more easily monitored without lockers than with lockers.”

Statement 16 has a 99.1% validity rating.

Of the 233 responses to lockerless schools providing easier hall monitoring, 89.3% agreed and 10.7% disagreed. Of the 211 teachers responding, 88.6% agreed and 11.4% disagreed. Of the 22 administrators responding, 95.5% agreed and 4.5% disagreed. An analysis of the results is located in Table 16.

Table 16: Easier Hall Monitoring

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	4.5	24	11.4	25	10.7
A/SA	21	95.5	187	88.6	208	89.3
Totals	22	100	211	100	233	100

Statement 17: “Visibility of the students in the hallways is improved without lockers than with lockers.”

Statement 17 has a 99.2% validity rating.

Of the 234 responses to lockerless schools improving hallway visibility, 91.9% agreed and 8.1% disagreed. Of the 212 teachers responding, 91.5% agreed and 8.5% disagreed. Of the 22 administrators responding, 95.5% agreed and 4.5% disagreed. An analysis of the results is located in Table 17.

Table 17: Improved Hallway Visibility

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	4.5	18	8.5	19	8.1
A/SA	21	95.5	194	91.5	215	91.9
Totals	22	100	221	100	234	100

Statement 18: “The school building is easier to secure without lockers than with lockers.”

Statement 18 has a 93.3% validity rating, and a significant variance of 0.000.

Of the 222 responses to lockerless schools providing easier building security, 86% agreed and 14% disagreed. Of the 202 teachers responding, 84.7% agreed and 15.3% disagreed. Of the 20 administrators responding, 100% agreed and 0% disagreed. An analysis of the results is located in Table 18.

Table 18: Easier Building Security

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	0	0	31	15.3	31	14
A/SA	20	100	171	84.7	191	86
Totals	20	100	202	100	222	100

Sub-topic Analysis for Corridor Monitoring and Egress (Statements 12, 13, 16, 17, & 18):

Of the 1123 combined responses concerning a lockerless school improving corridor monitoring and egress, 87.8% agreed and 12.2% disagreed. Of the 1017 combined

teacher responses 87.1% agreed and 12.9% disagreed. Of the 106 combined administrator responses 94.3% agreed and 5.7% disagreed. An analysis of the results is located in Table O.

Table O: Combined Data for Corridor Monitoring and Egress

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	6	5.7	131	12.9	137	12.2
A/SA	100	94.3	886	87.1	986	87.8
Totals	106	100	1017	100	1123	100

Sub-topic: Student Backpacks

Statement 15: “Student backpacks are heavier and cause back injury in a school without lockers as opposed to a school with lockers.” (This statement was presented in antithetical form to better represent a common criticism of lockerless schools.)

Statement 17 has an 88.5% validity rating.

Of the 208 responses to lockerless schools causing student back injury, 47.1% agreed and 52.9% disagreed. Of the 188 teachers responding, 47.3% agreed and 52.7% disagreed. Of the 20 administrators responding, 45% agreed and 55% disagreed. An analysis of the results is located in Table 15.

Table 15: Backpacks Cause Student Back Injury

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	11	55	99	52.7	110	52.9
A/SA	9	45	87	47.3	98	47.1
Totals	20	100	188	100	208	100

Total Category Analysis - Safety and Security

Statement 1-18: (Statement 15 data was reversed due to its antithetical form)

Of the 3915 total responses regarding a lockerless school improving a campuses safety and security 73% agreed and 27% disagreed. Of the 3556 total teacher responses 72% agreed and 28% disagreed. Of the 359 total administrator responses 82.5% agreed and 17.5% disagreed. An analysis of the results is located in Table P.

Table P: Total Category Analysis- Safety and Security

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	63	17.5	994	28	1057	27
A/SA	296	82.5	2562	72	2858	73
Totals	359	100	3556	100	3915	100

Learning Environment Criterion Statements Results

The Learning Environment statements of the survey have been grouped into the following sub-topics:

Table Q: Learning Environment Sub-topics

Student Comfort- statements 19, 22, & 26

School Climate- statements 20, 21, 24, 25, & 27

Student Organization- statements 23, 28, & 29

Student Problems- statements 30, 31, 32

Total Category Analysis- Learning Environment

These sub-topics all influence the physiological and psychological aspects of a campuses learning environment. Survey data for the Learning Environment criterion statements will be reported by individual statement analysis, sub-topic combined analysis, and complete category analysis.

Sub-topic: Student Comfort

Statement 19: “My school has a lower occurrence of absences without lockers than with lockers.”

Statement 19 has a 65.7% validity rating.

Of the 151 responses to lockerless schools causing a lower occurrence of absence, 27.2% agreed and 72.8% disagreed. Of the 135 teachers responding, 25.9% agreed and 74.1% disagreed. Of the 16 administrators responding, 37.5% agreed and 62.5% disagreed. An analysis of the results is located in Table 19.

Table 19: Lower Occurrence of Absence

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	10	62.5	100	74.1	110	72.8
A/SA	6	37.5	35	25.9	41	27.2
Totals	16	100	135	100	151	100

Statement 22: “Students are more secure in hallways without lockers than in hallways with lockers.”

Statement 22 has a 90.9% validity rating.

Of the 211 responses to lockerless schools creating secure student hallways, 80.1% agreed and 19.9% disagreed. Of the 190 teachers responding, 78.9% agreed and 21.1% disagreed. Of the 21 administrators responding, 90.5% agreed and 9.5% disagreed. An analysis of the results is located in Table 22.

Table 22: Students Feel Secure in Hallways

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	2	9.5	40	21.1	42	19.9
A/SA	19	90.5	150	78.9	169	80.1
Totals	21	100	190	100	211	100

Statement 26: “The passing period is less stressful for students in a school without lockers than one with lockers.”

Statement 26 has a 93.5% validity rating.

Of the 215 responses to lockerless schools having less stressful passing periods, 85.1% agreed and 14.9% disagreed. Of the 187 teachers responding, 84% agreed and 16% disagreed. Of the 22 administrators responding, 90.9% agreed and 9.1% disagreed. An analysis of the results is located in Table 26.

Table 26: Less Stressful Passing Periods

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	2	9.1	30	16	32	14.9
A/SA	20	90.9	157	84	183	85.1
Totals	22	100	187	100	215	100

Sub-topic Analysis for Student Comfort (Statements 19, 22, & 26):

Of the 577 combined responses concerning a lockerless school improving student comfort, 68.1% agreed and 31.9% disagreed. Of the 512 combined teacher responses 56.8% agreed and 43.2% disagreed. Of the 59 combined administrator responses 76.3% agreed and 23.7% disagreed. An analysis of the results is located in Table R.

Table R: Combined Data for Student Comfort

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	14	23.7	170	43.2	184	31.9
A/SA	45	76.3	342	56.8	393	68.1
Totals	59	100	512	100	577	100

Sub-topic: School Climate

Statement 20: “My schools hallways are quieter without lockers than with lockers.”

Statement 20 has a 99.6% validity rating, and a significant variance of 0.000.

Of the 224 responses to lockerless schools being quieter, 87.1% agreed and 12.9% disagreed. Of the 203 teachers responding, 85.7% agreed and 14.3% disagreed. Of the 21 administrators responding, 100% agreed and 0% disagreed. An analysis of the results is located in Table 20.

Table 20: Quiet Hallways

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	0	0	29	14.3	29	12.9
A/SA	21	100	174	85.7	195	87.1
Totals	21	100	203	100	224	100

Statement 21: “My schools hallways are cleaner without lockers than with lockers.”

Statement 21 has a 97.5% validity rating, and a significant variance of 0.000.

Of the 230 responses to lockerless schools being cleaner, 87.8% agreed and 12.2% disagreed. Of the 203 teachers responding, 85.7% agreed and 14.3% disagreed. Of the 21 administrators responding, 100% agreed and 0% disagreed. An analysis of the results is located in Table 21.

Table 21: Cleaner Hallways

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	0	0	29	14.3	28	12.2
A/SA	21	100	174	85.7	202	87.8
Totals	21	100	203	100	230	100

Statement 24: “Teachers have less distractions in a school without lockers than one with lockers.”

Statement 24 has a 92.9% validity rating, and a significant variance of 0.013. Of the 222 responses to lockerless schools having less class distractions, 74.3% agreed and 25.7% disagreed. Of the 200 teachers responding, 72.5% agreed and 27.5% disagreed. Of the 22 administrators responding, 90.9% agreed and 9.1% disagreed. An analysis of the results is located in Table 24.

Table 24: Less Class Distractions

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	2	9.1	55	27.5	57	25.7
A/SA	20	90.9	145	72.5	165	74.3
Totals	22	100	200	100	222	100

Statement 25: “Students are in hallways less during class in a school without lockers than one with lockers.”

Statement 25 has a 95.8% validity rating. Of the 226 responses to lockerless schools having fewer students in the hall during class, 73.5% agreed and 26.5% disagreed. Of the 204 teachers responding, 72.5% agreed and 27.5% disagreed. Of the 22 administrators responding, 81.8% agreed and 18.2% disagreed. An analysis of the results is located in Table 25.

Table 25: Less Students in Halls During Class

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	4	18.2	56	27.5	60	26.5
A/SA	18	81.8	148	72.5	166	73.5
Totals	22	100	204	100	226	100

Statement 27: “Teachers move easier between classes in a school without lockers than one with lockers.”

Statement 27 has a 93% validity rating, and a significant variance of 0.015.

Of the 212 responses to lockerless schools being easier for teachers to egress between class, 82.5% agreed and 17.5% disagreed. Of the 191 teachers responding, 81.2% agreed and 18.8% disagreed. Of the 21 administrators responding, 95.2% agreed and 4.8% disagreed. An analysis of the results is located in Table 27.

Table 27: Ease of Teacher Egress Between Class

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	1	4.8	36	18.8	37	17.5
A/SA	20	95.2	155	81.2	175	82.5
Totals	21	100	191	100	212	100

Sub-topic Analysis for School Climate (Statements 20, 21, 24, 25, & 27):

Of the 1114 combined responses concerning lockerless schools improving school climate, 81.1% agreed and 18.9% disagreed. Of the 1007 combined teacher responses 79.7% agreed and 20.3% disagreed. Of the 107 combined administrator responses 93.5% agreed and 6.5% disagreed. An analysis of the results is located in Table S.

Table S: Combined data for school climate

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	7	6.5	204	20.3	211	18.9
A/SA	100	93.5	803	79.7	903	81.1
Totals	107	100	1007	100	1114	100

Sub-topic: Student Organization

Statement 23: “Students come to class better prepared in a school without lockers than one with lockers.”

Statement 23 has a 90.2% validity rating, and a significant variance of 0.041.

Of the 211 responses to lockerless schools helping students come to class better prepared, 47.4% agreed and 52.6% disagreed. Of the 189 teachers responding, 45% agreed and 55% disagreed. Of the 22 administrators responding, 68.2% agreed and 31.8% disagreed.

An analysis of the results is located in Table 23.

Table 23: Students Come to Class Better Prepared

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	7	31.8	104	55	111	52.6
A/SA	15	68.2	85	45	100	47.4
Totals	22	100	189	100	211	100

Statement 28: “More homework is completed because the students have a textbook that stays at home in a lockerless school.”

Statement 28 has an 89.5% validity rating.

Of the 212 responses to lockerless schools improving homework completion, 49.1% agreed and 50.9% disagreed. Of the 191 teachers responding, 47.6% agreed and 52.4%

disagreed. Of the 21 administrators responding, 61.9% agreed and 38.1% disagreed. An analysis of the results is located in Table 28.

Table 28: More Homework Completed

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	8	38.1	100	52.4	108	50.9
A/SA	13	61.9	91	47.6	104	49.1
Totals	21	100	191	100	212	100

Statement 29: “The daily academic organizational process used by a student in a lockerless school aids the learning process more than using a locker to organize student academic materials.”

Statement 29 has an 89.2% validity rating.

Of the 206 responses to lockerless schools having better student organizational processes, 67.5% agreed and 32.5% disagreed. Of the 185 teachers responding, 65.9% agreed and 34.1% disagreed. Of the 21 administrators responding, 81% agreed and 19% disagreed. An analysis of the results is located in Table 29.

Table 29: Better Student Organizational Processes

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	4	19	63	34.1	67	32.5
A/SA	17	81	122	65.9	139	67.5
Totals	21	100	185	100	206	100

Sub-topic Analysis for Student Organization (Statements 23, 28, & 29):

Of the 599 combined responses regarding lockerless schools improving student organization, 52.3% agreed and 47.7% disagreed. Of the 565 combined teacher responses 52.7% agreed and 47.3% disagreed. Of the 64 combined administrator

responses 70.3% agreed and 29.7% disagreed. An analysis of the results is located in Table T.

Table T: Combined Data for Student Organization

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	19	29.7	267	47.3	286	47.7
A/SA	45	70.3	298	52.7	313	52.3
Totals	64	100	565	100	599	100

Sub-topic: Student Problems

Statement 30: “Students wearing coats and jackets is more of a problem in a school without lockers than with lockers.” (This statement was presented in antithetical form to better represent a common criticism of lockerless schools.)

Statement 30 has a 93.1% validity rating.

Of the 217 responses to lockerless schools having problems with coats and jackets, 33.6% agreed and 66.4% disagreed. Of the 195 teachers responding, 32.8% agreed and 67.2% disagreed. Of the 22 administrators responding, 40.9% agreed and 59.1% disagreed. An analysis of the results is located in Table 30.

Table 30: Problems with Coats and Jackets

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	13	59.1	131	67.2	144	66.4
A/SA	9	40.9	64	32.8	73	33.6
Totals	22	100	195	100	217	100

Statement 31: “Storing student lunches is more of a problem in a school without lockers than with lockers.” (This statement was presented in antithetical form to better represent a common criticism of lockerless schools.)

Statement 31 has a 91% validity rating.

Of the 211 responses to lockerless schools having problems storing student lunches, 38.9% agreed and 61.1% disagreed. Of the 190 teachers responding, 38.4% agreed and 61.6% disagreed. Of the 21 administrators responding, 42.9% agreed and 57.1% disagreed. An analysis of the results is located in Table 31.

Table 31: Problems Storing Student Lunches

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	12	57.1	117	61.6	129	61.1
A/SA	9	42.9	73	38.4	82	38.9
Totals	21	100	190	100	211	100

Statement 32: “Storing student personal items is more of a problem in a school without lockers than with lockers.” (This statement was presented in antithetical form to better represent a common criticism of lockerless schools.)

Statement 32 has a 96.1% validity rating.

Of the 225 responses to lockerless schools having problems storing student personal items, 48% agreed and 52% disagreed. Of the 203 teachers responding, 47.8% agreed and 52.2% disagreed. Of the 22 administrators responding, 50% agreed and 50% disagreed. An analysis of the results is located in Table 32.

Table 32: Problems Storing Student Personal Items

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	11	50	106	52.2	117	52
A/SA	11	50	97	47.8	108	48
Totals	22	100	203	100	225	100

Sub-topic Analysis for Student Problems (Statements 30, 31, & 32):

Of the 653 combined responses concerning lockerless schools causing student problems, 40.3% agreed and 59.7% disagreed. Of the 588 combined teacher responses 39.8% agreed and 60.2% disagreed. Of the 65 combined administrator responses 44.6% agreed and 55.4% disagreed. An analysis of the results is located in Table U.

Table U: Combined Data for Student Problems

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	36	55.4	354	60.2	390	59.7
A/SA	29	44.6	234	39.8	263	40.3
Totals	65	100	588	100	653	100

Total Category Analysis - Learning Environment

Statements 19-32 (Statements 30, 31, & 32 data was reversed due to their antithetical form)

Of the 2973 total responses regarding a lockerless school improving a campuses learning environment 68.2% agreed and 31.8% disagreed. Of the 2672 total teacher responses 67.3% agreed and 32.7% disagreed. Of the 295 total administrator responses 76.6% agreed and 23.4% disagreed. An analysis of the results is located in Table V.

Table V: Total Category Analysis- Learning Environment

	N:A	%:A	N:T	%:T	N:All	%:All
SD/D	6	23.4	875	32.7	944	31.8
A/SA	226	76.6	1797	67.3	2029	68.2
Totals	295	100	2672	100	2973	100

Survey Comments

The survey solicited comments at the end of Category A: Safety and Security, and Category B: Learning Environment. Of the two hundred and thirty-nine surveys

returned, eighty-three respondents wrote comments, of those, seventy-four were teachers and nine were administrators. In Category A: Safety and Security, sixty-one comments were offered, of those thirty-nine agreed with the lockerless school concept and twenty-two disagreed. In Category B: Learning Environment fifty-three comments were offered, of those, forty agreed with the lockerless school concept and thirteen disagreed.

The results of the comments are acknowledged through the identification of sub-themes. These sub-themes directly correlate and add to the previously identified sub-topics used when grouping the survey Likert rating data for analysis. The comment section of this study on the effectiveness of lockerless schools found definition through the following sub-themes of each category.

Comments in the category of Safety and Security defined the following eight sub-themes: student-contraband; student concerns; student violence; corridor monitoring and egress; student textbooks; student backpacks; combined backpacks and textbooks; and holistic safety and security statements.

Student Contraband refers to comments concerning the occurrence of drugs, weapons, alcohol, tobacco, or illegal student possessions. *Student Violence* refers to comments regarding student fights, conflicts and bullying. *Corridor Monitoring and Egress* refers to comments about hallway egress, visibility, monitoring, and security. *Student Textbooks* refers to comments concerning classroom and home book availability and lost or damaged texts. *Student Backpacks* refers to comments regarding backpack usage and weight. *Combined Backpack and Textbooks* refers to comments linking school policies on textbooks or lockers to student backpack use. *Holistic Safety and Security* statements

refer to comments that reflect the general attitude of a respondent toward lockerless schools.

Comments in the category of Learning Environment define the following six sub-themes: student organization, school climate, student comfort, student personal items, combined student personal items and backpacks, and holistic learning environment statements. *Student Organization* refers to comments regarding students being prepared for class, academically organized, and homework returned. *School Climate* refers to comments about noise, cleanliness, and distractions during class. *Student Comfort* refers to comments regarding student stress and feeling secure in the halls. *Student Personal Items* refers to comments about student coats, lunches, and personal property. *Combined Personal Items and Backpacks* refers to comments that link student personal property to backpack usage. *Holistic Learning Environment* statements refer to comments that reflect the general attitude of the respondent toward lockerless schools.

Each category sub-theme will be displayed by listing the comments in oppositional groups. The first group will be those comments that agree with the lockerless school concept. The second group will be the comments that disagree with the lockerless school concept. In order to prevent duplication all comments are not listed. Comments chosen best represent the meaning of duplicated statements.

Safety and Security Comments

Student Contraband- agreeing comments

- “Not having lockers for students means there is no place for them to hide anything, this is the second best decision we made when building this school. The best decision was installing security cameras.”
- “School lockers cause more problems than they are worth. Students do not need to bring all the ‘stuff’ that they collect in backpacks and lockers. It is impossible to fit middle school students in the space provided for lockers. It is a constant source of conflict.”
- “Students were keeping drugs in the locker.”
- “Although students still find ways of bringing drugs or contraband, I enjoy not having to worry about the bigger problems that come with lockers.”
- “We have a no backpack rule as well to prevent bringing contraband to school as well as no lockers.”

Student Contraband- disagreeing comments

- “The drugs, contrabands, tardies, etc... do not decrease because there is easy access to bags, backpacks, and most of all vehicles.”
- “I wasn’t sure about drugs. I’ve noticed that there seems to be contraband, etc. in backpacks also.”
- “Contraband has moved form the locker to the backpacks, but it is still present.”
- “Really makes no difference in most cases as backpacks and baggy clothes hide illicit and contraband materials as easily as lockers.”

Student Concerns- agreeing comments

- “Because of less tardies I promote lockerless schools to all my friends in education.”
- “Students get to class quicker.”

Student Concerns- disagreeing comments

- “The students are able to find things more readily in a locker (if it has a lock) than when their personal items are scattered between their purse, vehicle, athletic locker, and/or backpack.”
- “I see no difference in tardies and just as many students come to class tardy. Tardies are a personal discipline problem and not related to lockers. Students who are on time will always manage to be on time. Those who are tardy are socializing.”
- “At which students who don’t want to carry their backpack simply leave them in the hallway for anyone to get. This is a tripping hazard and a place where stealing occurs.”

Student Violence- agreeing comments

- “Students were harassed at the lockers for lunch money.”
- “When I taught in a school with lockers, we were constantly having problems in the hall. There were fights in the hall.”
- “We still have discipline issues that need to be addressed but because of not having lockers, it has been less.”

Student Violence- disagreeing comments

- “Student fights still occur on campus due to misunderstandings. The lack of lockers takes away a weapon, i.e. the locker door.”

Corridor Monitoring and Egress- agreeing comments

- “Definitely better movement behavior in hallways without lockers.”
- “With lockers, the halls during passing period were always congested. Students would be trying to get to their lockers and couldn’t reach it because there were other students in the way. Also they would start talking to the person at the locker next to them and then be late to class.”
- “The hallways are quiet and the flow of students is more effective. This is a ‘real world’ environment- there are no lockers at college or in the workfield.”
- “Not having lockers may be easier on the teachers (monitoring and visibility) but is definitely harder on the students”

Corridor Monitoring and Egress- disagreeing comments

- “Because our school is so spread out, the five minute passing period is still needed. Many students, who would have been at lockers to put away and retrieve materials are standing in the halls socializing or creating havoc with the extra time.”

Student Textbooks- agreeing comments

- “There has not been a single book lost from my class and all students have returned their books in ‘good shape’ at the end of the year.”

- “We keep a set of textbooks in the classroom and send textbooks home with students at the beginning of the year. They need only carry a binder (zipper works best).”
- “Students have a set of books at home to use for assignments. Each classroom has enough textbooks for each student to have one during the class period.”
- “The school has no need for lockers as long as enough books are provided for each class to issue two per student.”

Student Textbooks- disagreeing comments

- “The only negative that I see is the toll taken on classroom sets of textbooks with 4 out of 6 classes having over 30 students it’s a challenge to preserve books.”
- “Our biggest disadvantage without lockers is having to buy additional books because we provide take home books and each teacher maintains a classroom set.”
- “Our current policy is to purchase textbooks at a rate of 10% above enrollment- 50 students= 55 textbooks. How do we send a book home with numbers like that?”
- “Our school does not have books in class and at home- not enough money to do this. The state only gives 1 book per student.”

Student Backpacks- agreeing comments

- “I also had students that didn’t like where their locker was that they brought backpacks and carried all their books, I think having a set of books in the room relieves them from carrying so many books.”

- “We have no backpacks or lockers in school. Students only have a zippered binder.”
- “Heavy backpacks cause pain-- This cause and effect are hardly proven--most students end up cheating using defacto lockers in teacher’s rooms... or their cars.”
- “The only reason in my opinion that backpacks are heavier is due to the lack of organization by students. They stuff papers and supplies that they no longer need into the backpack adding weight.”
- “The backpacks become lighter because with a take-home set of textbooks, the students have little to carry.”

Student Backpacks- disagreeing comments

- “Backpacks are not as heavy, but they are still heavy with notebooks for six to seven classes. Upperclassman have the option of storing an afternoon set of binders in their cars and retrieving them at lunch. When I have carried my ninth grade son’s backpack to the car for him, I am concerned about the weight he carries in the backpack on a daily basis.”
- “The students that were unorganized in a school with lockers are still unorganized. Their backpacks have become their new dumping ground. Students cram papers into their backpack, and they still can’t find them.”
- “The nurse has more complaints of back pain. I have instructions on my website re: how to properly carry a backpack.”
- “Other than the weight put on the students back (heavy backpacks) it has worked fine taking the lockers away.”

- “The only down side to no lockers is the backpacks.”

Combined Backpacks and Textbooks- agreeing comments

- “Each of our students has a set of textbooks at home while each teacher keeps a class set of texts in the classrooms. Therefore, there is no need to carry books every day.”
- “Along with our no locker concept, our students have a set of textbooks that stay at home all year and a set to use in the classroom. We do not allow backpacks, only zipper binders.”
- “Every teacher has a class set of textbooks, and students may check out their textbooks to leave at home during the year. Not only have we eliminated the problems with lockers & backpacks but also with damaged & lost textbooks.”
- Even when my school had lockers, students still chose to carry books with them in their backpacks instead of fight with crowded conditions while at their lockers.”
- “Lockers make students carry all books, without they have their books at home and have lighter backpacks.”

Combined Backpack and Textbook- disagreeing comments

- “The only disadvantage to a lockerless school is the problems of lost textbooks and heavy backpacks.”
- “Teachers need to be given a classroom set of books if students are to leave their books at home. Carrying all of their books is unreasonable.”

- “The atmosphere is much better without lockers but every teacher does not have a ‘classroom set’ of textbooks and students are required to carry all their books. That is unacceptable! If the school wants to be ‘lockerless’ that is ok, but students should not have to carry all the textbooks around. They are too heavy. Until each teacher has a classroom set, there need to be lockers.”

Holistic Safety and Security- agreeing comments

- “At first I thought the no locker concept was wrong. What would we do without lockers. I was wrong, it is so much better with no lockers and no backpacks. It is a good thing.”
- “Lockers are unnecessary and definitely present more of a problem than any good. A lockerless school is a safer school.”
- “Lockers caused more problems than they were worth.”
- “There are so many arguments against having lockers in the main school building that I cannot think of a valid reason to have them back.”
- “Getting rid of lockers has been a great success at this school.”
- “I thought I would hate not having lockers but now I hope I never have to deal with them again.”
- “I much prefer a school without lockers.”

Holistic Safety and Security- disagreeing comments

- “Things are still stolen, students are still in the hallway during class time, students are still tardy, and we still have a drug problem.”
- “I don’t think it has made that much of a difference.”

Learning Environment Comments

Student Organization- agreeing comments

- “Students usually have needed materials because there is no convenient locker available to forget them in.”
- “I have higher expectations of my students knowing a book is at home and not left in a locker.”
- “Having a class set of books and a book for each student to take home insures each student has a book during class.”
- “The kids learn to organize better without lockers.”
- “A mature student can handle the organization of a binder and locker. On the junior high level too many students are not ready for this.”
- “We no longer have to deal with the ‘I left it in my locker’ excuse.”
- “Students can’t use ‘going to my locker’ as an excuse to leave class.”
- “Without having lockers, reduces the excuses a student can give for not being prepared.”

Student Organization- disagreeing comments

- “Many students come to class with nothing in their hands, no notebook, paper and pencils, and no books. There is something to having to carry a book to class.”
- “I feel the students need to use lockers and be able to learn responsibility more. They are not being responsible as much at a Jr. High level and they need to be.”
- “Students show up without materials more often than they did with lockers.”

- “I believe student organization and preparedness is not dependent on lockers or no lockers. I also believe students can hide things in backpacks as easily as they can in lockers.”
- “I am not sure that lockers would or would not affect completed homework. Too many other variables involved.”
- “I get ‘I left it at home’ now, so not much change in getting homework on time.”

School Climate- agreeing comments

- “Are more controllable without the noise of the lockers.”
- The noise level in the hallway decreased significantly. We had students getting injured by hitting their head on lockers, fingers slammed in locker etc.”
- “The hallways are definitely quieter without lockers. The halls seem wider and lighter. They are also much quieter.”
- “Overall I like the school without lockers. Students left spoiled food in lockers and general trash for someone else to clean up at the end of the year.”
- “There are pros and cons. It is cleaner and neater but I have not seen that it (aka lockerless school) is a cure all to problems associated with lockers in a school.”
- “Much more sanitary without lockers (No place to leave left over food for weeks).”

School Climate- disagreeing comments

- “The distractions and hallway use during class have nothing to do with lockers. That’s more a lack of enforcements.”

Student Comfort- agreeing comments

- “This is the first school I have taught in that is lockerless. I believe it is a safer, friendlier environment.”
- “I truly believe that not having lockers is best for our school. Kids don’t have to be pressured to keeping things in their locker, they don’t want to have. We don’t have to worry about kids going to their lockers to pick up things that shouldn’t be there. The time it takes to go to the bathroom is less cause they don’t have to go to lockers.”
- “Without lockers it is: quieter, less stress on the students (opening combination locks and keys).”

Student Comfort- disagreeing comments

- “I worked in a school that had lockers one year and not the next. The only difference was fewer tardies, passing period was smoother, but there is not much difference otherwise. It made little to no difference to teachers or students. It is a non-issue.”

Student Personal Items- agreeing comments

- “They didn’t put jackets in lockers since we had many buildings and it was cold. The lockers stored books and stuff.”
- “The students have adjusted to having to carry everything around all day with them.”
- “Students are inventive and most know how to carry their coats, CD player and other equipment effectively.”

- “Students learn not to bring personal items to school. In our school without lockers very few students bring their lunch.”
- “Student should not have personal items needing storage. However, I allow students to have band instruments, class projects, etc. in my classroom as needed. These items would not fit in a standard locker regardless.”
- “Most students who have personal items may use a teachers room or their athletic locker for large personal items.”

Student Personal Items- disagreeing comments

- “I have food containers, clothing, athletic bags, student work and materials stored in my room regularly.”
- “When cold outside and warm inside coats and jackets don’t have a place.”

Combined Student Personal Items and Backpacks- agreeing comments

- “I would love to find a way to also eliminate backpacks and coats/jackets.”
- “Teachers need to monitor the backpacks and instruct that only the necessary items should be in it.”

Combined Student Personal Items and Backpacks- disagreeing comments

- “Backpacks in aisles increase accidents.”
- “Backpacks are used as luggage and take up too much classroom space either on the desk or as a stumbling block on the floor.”

Holistic Learning Environment- agreeing comments

- “I have seen no downside to our lockerless/backpackless system.”
- “Everything runs more smoothly without lockers.”

- “No lockers on campus has improved the learning environment.”
- “Much better situation with no lockers.”
- “I have not heard any complaints from students about lockers being taken away.”
- “As long as athletic lockers and lunch lockers are provided.”

Holistic Learning Environment- disagreeing comments

- “Academic performance hasn’t been affected by the ‘no locker’ environment.”
- “Students really need some type of storage area if they can’t store in designated area such as athletics, band, etc.”

Summary

This chapter reported the results of the research study on lockerless schools conducted over the spring and fall semesters of 2006. The study utilized an interview with Garland ISD maintenance and facility director, the 2006 11th Annual Construction Report for School Planning and Management, and documents from the Texas Education Agency in preparing the cost/benefit analysis and life-cycle cost analysis of lockerless schools. Surveys were completed by teachers and administrators at twelve, Texas lockerless schools. These respondents all had experience working at lockerless campuses and campuses without locker. These surveys required a Likert scale rating of each statement to determine agreement or disagreement. Each respondent was given an opportunity to comment on their lockerless school in regard to safety and security and learning environment.

The cost/benefit analysis was used to illustrate the monetary difference in new construction and renovation when considering the locker issue in a secondary school.

The life-cycle cost analysis was used to illustrate how savings can be realized over time when a campus is built without lockers.

All thirty-two of the survey questions were determined to be valid by the respondents. The survey statements were analyzed individually, by sub-topic and by categories. For comparison and analysis the category of Safety and Security was divided into the sub-topics of student contraband, student concerns, student textbooks, student violence, corridor monitoring and egress, and student backpacks. The category of Learning environment was divided into the sub-topics of student comfort, school climate, student organization, and student personal property. The descriptive and inferential statistics of the survey data added to the discussion.

Finally, the survey respondents were asked to comment after completing the Likert rating of each category. These comments were grouped into sub-themes for ease of comparison and analysis. In the category Safety and Security comment sub-themes are- student contraband, student concerns, student violence, corridor monitoring and egress, student textbooks, student backpacks, combined backpacks and textbooks, and holistic statements. In the category Learning Environment comment sub-themes are student organization, school climate, student comfort, student personal items, combined student personal items and backpacks, and holistic statements. The results of the survey comment section compliment the sub-topics of the survey and allow for elaboration of the individual survey statements.

This chapter provided detailed analysis of current cost/benefits and efficiencies associated with lockerless schools. It also analyzed the findings of the survey statements

and comments section by applying descriptive and inferential statistics, and detailed characteristics for each. The effect lockerless schools have on cost efficiency, safety and security and the learning environment will be revisited in Chapter V and the findings of this study described in detail. The chapter will conclude with a discussion of the conclusions brought forth by the data and recommendations for further study.

CHAPTER V
DISCUSSION, CONCLUSION, AND RECOMMENDATION FOR FUTURE
RESEARCH

Chapter V contains a summary of the study and the findings discussed in Chapter IV, an analysis of those findings, a statement of appropriate conclusions, implications, limitations, and suggested recommendations for future studies.

Summary of the Study

This mixed method study of twelve surveyed Texas Lockerless schools has been presented with Garland ISD's current facility cost and TEA's textbook prices to investigate questions concerning the effects lockerless school have on cost efficiency, safety/security, and learning environment. The study questions were:

1. Are lockerless school more cost efficient than traditional schools with lockers?
2. Do lockerless school improve school security as opposed to traditional schools with lockers?
3. Do lockerless schools create a positive change in the learning environment as opposed to traditional school with lockers?

The facility director of Garland ISD, Danny Wilkins, was interviewed to determine locker related facility cost for an urban Texas school district. He provided cost, maintenance and repair information on eleven topics pertaining to secondary school lockers. These costs were based on a campus of 1200 students. This information was displayed in topic cost per student and per campus. These eleven topics were then combined and analyzed in the areas of new construction, renovation, and operations.

To set a consistent textbook cost this study used the Texas Education Agency's price for a new book. These prices were converted into a lockerless school book cost. These prices were then used to calculate a lockerless school book requirement for a four year high school of 1200 students. These calculations were described per student and per campus for the four topics of initial, annual and 2% or 5% lost text book cost. These costs were then combined with the facility topic cost to best represent a cost analysis for new construction, renovation, and operation of a school with or without lockers.

From the twelve lockerless schools surveyed two hundred and thirty-nine surveys were returned. Two hundred and seventeen surveys were completed by teachers and twenty-two were completed by administrators. The campuses surveyed ranged from Junior High to Senior High school, small campuses to large campuses, rural schools to urban schools, and each had differing ethnicity, diversity, and economics. Eight of these campuses were new and four were renovated. These campuses experiences as a lockerless school ranged from one to eight years.

The survey requested a Likert rating of agree to disagree for students under the categories of safety/security and learning environment of lockerless schools. The survey results are displayed by individual statement analysis, sub-topic combined statement analysis, and complete category analysis.

The survey also requested comments at the end of the two categories. Eighty-three respondents wrote comments, seventy-four were teacher comments, and nine were administrator comments. These comments are acknowledged through the identification of sub-themes. For the purpose of cross reference analysis the comment sub-themes vary

little from the statement sub-topics. Each category comments are displayed by sub-theme, with the agreeing comments listed first and the disagreeing comments listed second. Comments chosen for the list were screened to eliminate duplicate statements.

Analysis of Findings

The process of changing to a lockerless school is a complex system that involves people, property, technology, and tradition. Each part integrates with the next and no part stands alone. Paul Mort's study at Columbia University described change in schools as a three phase process. The first phase is tied directly to cost efficiency. Mort states: "The best single predictor of school innovativeness is educational cost per pupil" (Ball, 1987, p. 29). This must occur before his second phase, which is a twenty-five year lag before the change is accepted as a best practice. His third phase is then the gradual adoption of the innovation one it's proven as both a best practice and cost efficient.

This study concurs with Mort's findings and begins by describing the cost efficiencies of the innovative concept of lockerless schools. Study Question 1: Are lockerless schools more cost efficient than traditional schools with lockers?

Cost Efficiency Findings

This study sought to determine cost efficiency through the methods of cost/benefit analysis and life-cycle costing. These cost comparison practices are considered by the Council of Educational Facility Planners International to be an important part of project evaluation. Cost/benefit analysis is a concept more closely related to student performance, because it views building design and commodities in terms of benefits provided to the building inhabitants. In practice cost/benefit analysis matches the best set

of design features to the local needs considering expense as the primary variable.

“Cost/benefit analysis requires that benefits be expressed in monetary terms” (CEFPI, 1991, p. K7).

Cost/benefit analysis should be applied when evaluating a lockerless school’s need for additional books. The expense of the books should be analyzed for potential benefits. The local decision makers must decide if additional textbooks weighed against the savings of no locker costs have an educational benefit. A tangible cost/benefit could be realized in less lost textbooks or less damaged texts. An intangible benefit would be the benefit of having the textbook available in the classroom or at home for ease of student access thus eliminating the need for textbook locker storage and textbook transportation. “Because both costs and benefits are experienced over a period of years, it is essential that they be viewed in terms of life-cycle costs, not just acquisition costs” (CEFPI, 1991, p. K8). Life-cycle costing evaluates the initial purchase cost of products versus the long term cost involved in the ownership of these products. A school locker for example has an initial square footage cost, equipment cost, and installation cost. During ownership there will be a maintenance cost for the life of the lockers. “Attention should be given to total costs, which include the initial costs of a structure (or any of its components) as well as interest and the cost operation and maintenance. The objective is to determine the best method of satisfying a particular requirement at the least total cost” (CEFPI, 1991, p. K8). Experience with lockers and books or careful examination of schools with and without lockers can result in effective life-cycle costing. “The merits of life-cycle costing are not only that it improves economy by developing an awareness of

total costs and comparison of alternative systems, but that it also encourages an examination and understanding of the interrelationships between various aspects of building design and their costs” (CEFPI, 1991, p. K7).

Cost/Benefit in New Construction

The greatest savings associated with lockerless schools are realized in new secondary school construction. Table E explains the high construction cost of new locker installation. This \$335 cost per student is compared to the cost of per student classroom book purchases of \$36.57 in a lockerless school. Table E clearly shows a savings of \$298.57 per student. When this savings is converted into campus savings for a 1200 pupil campus, the total campus cost/benefit is \$402,000. This represents a project savings of close to a half of a million dollars per campus. This single cost/benefit analysis is why most lockerless schools are new school construction.

In the planning stages of new school construction it is normal to have the designed facility cost exceeding the budget cost. This problem is usually solved by cutting the least important or more decorative parts of the building to balance the budget causing the building to be very common and aesthetically less pleasing.

Deciding to build a school without lockers in the planning stage could solve the problem of balancing the budget. In the best case scenario additions, improvements, or expansions could be added to the project and still balance the budget. Such additions might include larger classrooms, expanded fine arts facilities, technology upgrades, more student commons space, or any variety of upgrades that improve a campus.

Table E explains the transfer of these cost savings when a school is designed without lockers but the square footage cost is converted into other facility needs. This allows a school district to convert \$110 per student square footage cost to campus additions. For a campus of 1200 pupils this is \$132,000. After subtracting book costs there is another \$188.43 savings per student and \$226,114 per campus. When totaling these two savings, the results are the original savings per student of \$298.57 and \$358,114 per campus. Therefore, if a new school were to be built lockerless but the planners decided to leave the square footage in the halls in case lockers would need to be added later, the project savings would be \$188.43 per student and \$226,114 per campus. This represents a project cost/benefit approaching a quarter million dollars that could be saved or put into additions to this campus or other campuses that have budget short falls.

The final analysis of Table E calculates a percentage of total savings if the secondary campus is built without lockers. This calculation uses a total cost of \$79,855,000 to build instructional space for a campus of 1425 students. If built without lockers, the school can realize a cost/benefit of \$425,462.25 which equates into a total project savings of .0214%. If the same calculations are done for this school and leaves the square footage in the building, the total percentage saved is .0135%. These percentages are important if a school district is considering new construction for more than one secondary school as part of a district wide building projects. For example if a district will be building instructional space for three secondary schools the cost can be estimated at 20 million per school equalizing 60 million for the district project. If all buildings are lockerless the cost/benefit savings is \$1,284,000. If the square footage of

lockers remained in the district building project the cost/benefit saving would be \$810,000. District total project savings of one million dollars are significant cost/benefits that all secondary school planners should consider before building a traditional school with lockers.

Cost/Benefit in Renovation

No initial cost/benefit can be realized when renovating a school with lockers to lockerless. Table F shows the cost to repair lockers if no new or replacement lockers are necessary is \$28.63 per student and \$34,350 per campus of 1200 pupils. The cost of remodeling when lockers are removed, plus buying textbooks for classroom sets is \$51.57 per student and \$27,516 per campus. Table F cost/benefit analysis proves that the initial cost to renovate to a lockerless campus is almost twice as high as a traditional renovation of lockers. This cost increase is the primary reason why many schools will chose not to renovate as lockerless.

The initial cost/benefit is not the only factor when considering locker removal from an existing campus. Operation life-cycle cost must be calculated to realize the full effect of going lockerless for a renovated campus or a new campus.

Operation Life-Cycle Cost

Annual operations cost in a lockerless school is significantly lower than those of a traditional school with lockers. Table G shows that a campus of 1200 pupils operation cost for maintaining lockers is \$20,797 annually. Annual operation cost for maintaining textbook classroom sets is \$15,197.38. This operation life-cycle cost comparison show that a lockerless school can realize an annual operation savings of \$5,599.62.

The complete analysis for operation life-cycle savings must be calculated over twenty years. This is the life span of a student locker before total renovation or replacement must occur. Consequently, the total operation life-cycle savings for a new lockerless campus is \$111,992.80. To calculate total operation life-cycle savings for a renovated campus, one must subtract the initial cost increase of \$27,516 from the twenty year operational life-cycle savings of \$111,992 to realize an \$84,476.80 life-cycle savings over the twenty years of operation. This ends up being a cost/benefit savings for the last fifteen years.

Operation life-cycle costing is an important part of the lockerless school total picture because of its ability to provide a twenty year analysis of cost efficiency. In the case of a new lockerless campus the complete savings is calculated by adding the initial cost/benefit saving of \$408,514 to the total annual operation life-cycle savings of \$111,992.80, resulting in a \$520,506.80 combined twenty year savings. In the case of a renovated lockerless campus the complete twenty year savings is \$84,476, which is much less because the square footage remains in the building and the lockers are not totally replaced.

According to the Council for Educational Facility Planners International, "It is often difficult to reduce benefits to a dollar figure, particularly when they are intangible. One way of evading this dilemma is to cancel out such benefits when they are common to all the alternatives considered" (CEFPI, 1991, p. K8). In this study such benefits are the time of administrators, custodial staff, and security officers. Since their time at work is consistent in a school with lockers as one without, no dollar figure can be calculated as a

cost efficiency. These efficiency benefits are realized by time on other task because of the fewer problems and jobs associated with lockers. This efficiency benefit will not result in a reduction in staff which could represent a cost savings. Lockerless school personal cost savings will be realized with better job efficiency from administrators, custodial staff and security officers.

Cost Efficiency Conclusion

Parameters of cost efficiency for new construction, renovation, and operations of a school will be determined by local policies and these policies can be evaluated by life-cycle costing and cost/benefit analysis. “Both techniques provide information that can improve decision making by supplying objective reliable criteria with which site, building design, mechanical system, or pieces of furniture can be appraised in relation to others. Life-cycle costing and cost/benefit analysis are important because they allow an informed selection among alternatives based on total rather than initial costs and an examination of cost in terms of value received” (CEFPI, 1991, p. K7). School policy makers should consider building lockerless schools primarily for the cost saving benefits. These savings can be used to balance a construction budget or to add needed facilities that could not have been possible without the cost efficiencies realized by lockerless schools.

Educational funds are always scarce and should only be used to provide an adequate and efficient school facility. Recently, secondary schools have been built without lockers to help provide educational adequacy. The lockerless policy allows more square footage to be put into classroom or lab space. The non-congesting hallways of a

lockerless facility help the students and staff move efficiently to adjacent rooms or appointments. Enrichment features can be added to a lockerless school due to savings by not purchasing lockers. A lockerless buildings elimination of an old 20th century technology allows for better capacity. The following sections of this study explore how the absence of lockers aids in a safer, more secure building that enhances the learning environment. An adequate school is one that services students' educational needs today by preparing them for the future. An efficient school is one that is built by making timely decisions in the planning stages that allow for cost savings during construction and in future maintenance or renovation.

Survey Findings

The survey was designed to gather teacher and administrator opinions regarding safety/security and learning environment of their lockerless school. The survey only sought responses from teachers and administrators who witnessed the change process involved in transferring to a lockerless school. Changing to a lockerless school is a complex process and involves many different topics concerning school safety, security, discipline, climate, organization, comfort and health. Survey responses and comments to these types of campus concerns determine if the lockerless practice will evolve over time into a best practice.

Lockerless schools have existed for less than ten years in Texas. According to Paul Mort's theory, lockerless schools still need fifteen more years of practice before the concept can be accepted as a proven best practice and then gradually phased in as a proven educational concept. This study is embedded in the philosophy of Mort's time

frame and seeks to hasten the process by offering testament to the ability of a lockerless campus to improve school security and create a positive learning environment. Security design elements must be considered when building a new school or renovating an old one. School planners and architects must integrate current technology to enhance building security and help prevent school crime. Quite simply, school security is the prevention of crime at a school campus. With the increase in school-related crime, safety has taken on a high priority in American schools. Architects and planners recognize the need to design safe school environments to support the quality of instruction. “The proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement of the quality of life” (CEFPI, 2004, p. 5-25).

This survey will gather responses concerning the design and effective use of twelve lockerless schools in regard to security and learning environment. School safety and security can be addressed by building schools with physical characteristics that create comfort zones. The US Secret Service and Department of Education, in their manual *Threat Assessment in Schools-A Guide to Managing Threatening Situations and to Create a Safe School Climate*, recommends creating an atmosphere that allows students and staff to feel safe. “Building structure, facility safety plans, lighting space, and architecture, among other physical attributes of educational institutions, all can contribute to whether a school environment feels, or is in fact, safe or unsafe” (Fein, 2002, p. 71). This study seeks to discover if the absence of lockers is a physical attribute of a facility that contributes to the environment being safe and thus improving the learning process.

How students feel about their school environment is as important as what they feel. School safety is equally as important as ergonomics, classroom size, and temperature control. “Therefore, we can make a huge difference in our classrooms by realizing the importance of tending to physical and emotional climate with careful planning and heightened awareness of the importance of student comfort and safety” (Jensen, 2003, p. 1). Recent studies suggest that, whether perceived or real, the threat of violence in the learning environment can have a negative impact on cognition. Specifically, the stress associated with violence impacts test scores, absenteeism, tardiness, and attention span. (Hoffman 1996)

The response ratings to the survey statements and the comments offered combine to define how effective a lockerless school can be in improving teacher and administrator perceptions of their campuses safety, security, and learning environment. These findings provide the answers to Questions Two and Three of the study: 2. Do lockerless schools improve school security as opposed to traditional schools with lockers?; 3. Do lockerless schools create a positive change in the learning environment as opposed to traditional schools with lockers?

Safety/Security Statement Ratings and Comments

Upon final analysis of Category A: Safety and Security survey statements, the study found that teachers and administrators agree that lockerless schools are safer and more secure by a margin approaching three to one. Of all the valid responses, 73% agreed and 27% disagreed with the practice of lockerless schools for improving school safety and security (Table P). It is important to acknowledge that administrators agreed

that lockerless schools improved safety and security by a margin of nearly five to one. Of the twenty-two surveyed, 82.5% agreed and 17.5% disagreed (Table P). The extent of support for a lockerless campus safety and security varies by individual statement and sub-topic, but overall remains favorable to the practice. The comments offered enrich and support the statistical analysis of the survey.

Examples of agreeing comments are: “Lockers are unnecessary and defiantly present more of a problem than any good. A lockerless school is a safer school.”; “There are so many arguments against having lockers in the main school building that I cannot think of a valid reason to have them back.”; “I thought I would hate not having lockers, but now I hope I never have to deal with them again.”

Examples of disagreeing comments are: “Things are still stolen, students are still in the hallway during class time, students are still tardy and we still have a drug problem.”; “I don’t think it has made that much of a difference.”

Safety/Security Sub-topic Results

Survey results of the four statements combining to form the sub-topic, School Contraband, concluded that teachers and administrators agreed that lockerless schools prevent school contraband by a margin of three to one. Combined statement analysis shows that 75.3% of all responses agree and 24.7% disagree (Table K). Administrators overwhelmingly agree by 95.1% and disagreed by 4.9% that their schools contraband problem is better without lockers (Table K).

Examples of agreeing comments are: “Not having lockers for students means there is no place for them to hide anything, this is the second best decision we made when

building this school. The best decision was installing security cameras.”; “Students were keeping drugs in the locker”; “Although students still find ways of bringing drugs or contraband, I enjoy not having to worry about the bigger problems that come with lockers.”.

Examples of disagreeing comments are: “The drugs, contraband, tardies, etc... do not decrease because there is easy access to bags, backpacks, and most of all vehicles.”; “Really makes no difference in most cases as backpacks and baggy clothes hide illicit and contraband materials as easily as lockers.”

Survey results of the three statements combining to form the sub-topic School Violence conclude that teachers and administrators agree that lockerless schools aid in preventing school violence by a margin just short of two to one. Combined statement analysis shows that 62.6% of all responses agree and 37.4% disagree (Table L). Administrators agree to a greater extent of 73.4% and disagree by 26.6% that their schools violence is decreased without lockers (Table L).

Examples of agreeing comments are: “Students were harassed at the lockers for lunch money.”; “When I taught in a school with lockers, we were constantly having problems in the hall. There were fights in the hall.”

The only disagreeing comment is: “Student fights still occur on campus due to misunderstandings. The lack of lockers just takes away a weapon, i.e. the locker door.”

Survey results of the two statements combining to form the sub-topic Student Textbooks concluded that teachers and administrators agree that lockerless schools aid in preserving textbooks by a margin of two to one. Combined statement analysis shows that

65.3% agree and 34.7% disagree (Table M). Administrators agree to a greater extent of 71% and disagree by 29% that their lockerless campus has lower occurrence of damaged and lost textbooks (Table M).

Examples of agreeing comments are: “There has not been a single book lost from my class and all students have returned their books in good shape at the end of the year.”; “We keep a set of textbooks in the classroom and send textbooks home with students at the beginning of the year. They need only carry a binder.”

Examples of disagreeing comments are: “The only negative that I see is the toll taken on classroom sets of textbooks with 4 out of 6 classes having over 30 students it’s a challenge to preserve books.”; “Our current policy is to purchase textbooks at a rate of 10% above enrollment- 50 students= 55 textbooks. How do we send a book home with numbers like that?”

Survey results of the one statement combining to form the sub-topic of Student Backpacks, concludes that teachers and administrators are equally split on the idea that backpack’s can cause injury to students. Statement analysis shows that 52.9% disagree and 47.1% agree that backpacks cause student injury (Table 15). Administrators opinions on backpack is similarly split, with 55% disagreeing and 45% agreeing that backpacks cause student injury (Table 15).

Examples of disagreeing comments are: “I also had students that didn’t like where their locker was that they brought backpacks and carried all their books, I think having a set of books in the room relieves them from carrying so many books.”; “Heavy

backpacks cause pain, this cause and effect are hardly proven- most students end up cheating and using defacto lockers in teacher's rooms or their cars.”.

Examples of agreeing comments are: “Backpacks are not as heavy, but they are still heavy with notebooks for six to seven classes. Upper classmen have the option of storing an afternoon set of binders in their cars and retrieving them at lunch. When I have carried my ninth grade son's backpack to the car for him, I am concerned about the weight he carries in the backpack on a daily basis.”; “The nurse has more complaints of back pain. I have instructions on my website re: how to properly carry a backpack.”

The majority of survey comments were concerning backpacks and/or textbooks. This is due to some of the schools in the survey not having enough books for classroom sets. To better emphasize this concern the study comment section includes a combined sub-theme of opinions concerning both sub-topics. These comments conclude that a lockerless campus must have a classroom sets of textbooks to operate appropriately.

Examples of comments agreeing with the schools classroom textbooks and backpack policy are: “Each of our students has a set of textbooks at home while each teacher keeps a class set of texts in the classroom. Therefore, there is no need to carry books every day.”; “Lockers make students carry all books, without them students have their books at home and have lighter backpacks.”

Examples of comments disagreeing with schools classroom textbook and backpack policy are: “The only disadvantage to a lockerless school is the problem of lost textbooks and heavy backpacks.”; “Teachers need to be given a classroom set of books if students are to leave their books at home. Carrying all of their books is unreasonable.”

Survey results of the three statements combining to form the sub-topic Student Concerns conclude that teachers and administrators agree that theft and lost personal property by a margin of two to one. Combined statement analysis shows that 66.7% of all respondents agree and 33.3% disagree (Table N). Administrators agree to a greater extent of 72.1% and disagree by 27.9% that their school reduce student tardies, theft, and lost personal items (Table N).

Examples of agreeing comments are: “Because of less tardies- I promote lockerless schools to all my friends in education.”; “Students get to class quicker.”

Examples of disagreeing comments are: “I see no difference in tardies and just as many students come to class tardy. Tardies are a personal discipline problem and not related to lockers. Students who are on time will always manage to be on time. Those who are tardy are socializing.”; “At lunch students who don’t want to carry their backpack simply leave them in the hallway for anyone to get. This is a tripping hazard and a place where stealing occurs.”

Survey results of the five statements combining to form the sub-topic Corridor Monitoring and Egress conclude that teachers and administrators agree that lockerless schools improve hallway egress, visibility, monitoring, safety and security by a margin of seven to one. Combined statement analysis shows that 87.8% agree and 12.2% disagree (Table O). Administrators agree to a greater extent of 94.3% and disagree by 5.7% that their schools corridors are safer, more secure and easier to control without lockers (Table O).

Examples of agreeing comments are: “Definitely better movement and behavior in hallways without lockers.”; “The hallways are quiet and the flow of students is more effective. This is a real world environment- there are no lockers at college or in the work field.”.

The only disagreeing comment is: “Because our school is so spread out, the five minute passing period is still needed. Many students who would have been at lockers to put away and retrieve materials, are standing in the halls socializing or creating havoc with the extra time.”

Safety and Security Conclusion

The survey results all support lockerless schools ability to improve safety and security. On a lockerless campus contraband violence, theft, and tardies are reduced, hallways are safer and easier to monitor, and textbooks get better care. The concern about heavy backpacks causing injury is the only area where the lockerless policy does not clearly rank better than schools with lockers. The message of School Safety and Security is transmitted by the big picture of the total school environment. The condition of the classroom is important but everything that supports the classroom is of equal importance. A school’s corridors, textbooks, discipline, student concerns, and general health imparts the vision of our schools educational expectations. “A strong correlation exists between the design of a facility and the achievement of the students who attend school there. Research clearly demonstrates the accuracy of this intuitive truth and shows that educational planners need to take every opportunity to enhance teaching and learning through purposeful design of school buildings and grounds. Over the past five years,

researchers have concluded that many more factors affect student achievement than simply how the teacher imparts information” (CEFPI, 2004, p. 2).

Learning Environment Statement Ratings and Comments

Upon final analysis of Category B: Learning Environment survey statements, the study found that teachers and administrators agree that lockerless schools provide a better learning environment by a margin slightly greater than two to one. Of all the valid responses 68.2% agreed and 31.8% disagreed that the practice improved the learning environment (Table V). It is important to acknowledge that the administrators agreed strongly that lockerless schools improved the learning environment by a margin of three to one. Of the twenty-two surveyed 76.6% agreed and 23.4% disagreed (Table V). The extent of support for a lockerless campus learning environment varies by individual statement and sub-topic, but overall remains favorable to the practice. The comments offered enrich and support the statistical analysis of the survey.

Examples of agreeing comments are: “Everything runs more smoothly without lockers.”; “No lockers on campus has improved the learning environment.”

Examples of disagreeing comments are: “Academic performance hasn’t been affected by the no locker environment.”; “Students really need some type of storage area if they can’t store in designated area, such as athletics, band, etc.”

Learning Environment Sub-topic Results

Survey results of the three statements combining to form the sub-topic Student Comfort concluded that teacher and administrators agree that lockerless school provide a comfortable environment by a margin of two to one. Combined statement analysis shows

that 68.1% agree and 31.9% disagree (Table R). Administrators agreed by 76.3% and disagree by 23.7% that their lockerless campus provided better student comfort (Table R). These statistics weighed favorably for lockerless schools even though the statement of a lower occurrence of absences was disagreed with by 72.8% of all surveyed (Table 19). The statements concerning secure halls and less stressful halls were both agreed with by over 80% of all surveyed (Table 22 & 26).

Examples of agreeing comments are: “Without lockers it is: quieter, less stress on the students (opening combination locks and losing keys).”; “I truly believe that not having lockers is best for our school. Kids don’t have to be pressed to keeping things in their locker they don’t want to have. We don’t have to worry about kids going to their lockers to pick up things that shouldn’t be there. The time it takes to go to bathroom is less because they don’t have to go to lockers.”

The only disagreeing comment is: “I worked in a school that had lockers one year and not the next. The only difference was fewer tardies, passing period was smoother, but there is not much difference otherwise. It made little to no difference to teachers or students. It is a non-issue.”

Survey results of the five statements combining to form the sub-topic of School Climate concluded that teachers and administrators agree that lockerless schools improve school climate by a margin of more than four to one. Combined statement analysis shows that 81.1% agree and 18.9 % disagree (Table S). Administrators agree by 93.6% and disagreed by 6.4% that their lockerless campuses are cleaner, quieter, less congested, and have fewer class distractions (Table S).

Examples of agreeing comments are: “Much more sanitary without lockers (no place to leave left-over food for weeks).”; “The noise level in the hallway decreased significantly. We had students getting injured by hitting their head on lockers, and fingers slammed in lockers etc.”

The only disagreeing comment is: “The distractions and hallway use during class have nothing to do with lockers. That’s more of a lack of enforcements.”

Survey results of the three statements combining to form the sub-topic of Student Organization concluded that teachers and administrators are split on their opinion if lockerless schools can help student organization. The teachers are only 52.7% is favor of this idea, but the administrators are 70.3% favorable toward these results (Table T). In this sub-topic teachers only agreed by 65.9% that the daily academic organization process for students was better (Table 29). They disagreed by over 50% with more homework being completed or students coming to class better prepared (Table 28 & 23). The study results do not prove that a lockerless school promotes home work being turned in or students arriving to class better prepared, but all surveyed agree by 67% or two to one that students are in an environment that daily provides better academic organization (Table 29).

Examples of agreeing comments are: “Students usually have needed materials because there is no convenient locker available to forget them in.”; “I have higher expectations of my students knowing a book is at home and not left in a locker.”; “The kids learn to organize better without lockers.”.

Examples of disagreeing comments are: “Many students come to class with nothing in their hands, no notebook, paper and pencils, and no books. There is something to having to carry a book to class.”; “I feel the students need to use lockers and be able to learn responsibility more. They are not being responsible as much at a jr. high level and they need to be.”; “I am not sure that lockers would or would not affect completed homework. Too many other variables involved.”

Survey results of the three statements combining to form the sub-topic Student Problems concluded that teachers and administrators disagree that lockerless schools cause problems for students by a margin of almost two to one. Combined statement analysis shows that 59.7% disagree and 40.3% agree (Table V). Administrators disagree by 55.4% and disagree by 44.6% that their lockerless campus causes problems with coats, lunches and other student personal items (Table V). Storing jackets and lunches are not considered a problem by a margin of two to one (Table 30 & 31), but storing student personal items has a split opinion of 50% for both teachers and administrators (Table 32). These lockerless campuses have solved most problems with jackets and lunches but obviously struggle with storing personal items and backpacks.

Examples of disagreeing comments are: “Students are inventive and most learn how to carry their coats, CD player, and other equipment effectively.”; “Students learn not to bring personal items to school. In our school without lockers very few students bring their lunch.”; “Most students who have personal items may use a teachers room or their athletic locker for large personal items.”; “Teachers need to monitor the backpacks and instruct that only the necessary items should be in it.”

Examples of agreeing comments are: “I have food containers, clothing, athletic bags, student work, and materials stored in my room regularly.”; “When it is cold outside and warm inside coats and jackets don’t have a place.”

Learning Environment Conclusion

The survey results primarily support lockerless schools ability to improve the learning environment. Lockerless campuses are quieter, cleaner, feel more secure, have less distractions, less students in the hall during class, are less stressful, provide better teacher egress, and a better daily organizational process for students. Storing jackets and lunches are not a problem on these campuses. Lockerless campuses do not improve attendance, the rate of homework completion, or promote students coming to class better prepared. The survey is indecisive if storing student personal items is a problem or not. Previous research indicates a relationship between the campus environment and how students and teachers perform. While extensive research exists connecting the specifics of the classroom environment to student success, this study connects how the auxiliary learning spaces of schools effect learning. Every aspect of the brain friendly environment can be extended to the schools climate, comfort, organization, and problem solving abilities. If our students classrooms are safe brain friendly learning environments but the auxiliary spaces where our students spend up to one half their school day are not brain friendly, then we are only addressing half the problem. These auxiliary spaces are not as dominant in the learning environment as the classroom, but they share an equal importance in their physiological and psychological effects on the student and teacher. If our auxiliary spaces are clear, compatible, and psychological effects on the student and

teacher. If our auxiliary spaces are clean, compatible, organized, and student friendly, then the learners and teachers full school day can be an inspiring educational experience.

Conclusion

The conclusion of this study on lockerless schools cost efficiencies, safety and security, and learning environment supports previous research findings that innovative changes to educational facilities can improve and inspire better educational processes. Many studies suggest that good teaching and learning processes strongly tied to adequate facilities. John B Lyons (2002), founder of the National Clearing house for Educational Facilities, agrees. In an essay for Learning Design, Lyons remarks, It has been said that a good teacher can teach anywhere, but a growing body of research strongly suggest a direct relationship between a school's condition and the learning that goes on inside it. Individual classrooms and entire facilities need to be evaluated, not only on how they meet changing educational requirements, but also on how they meet the environmental requirements for health, safety, and security" (CEFPI, 2004, p. 2-7).

Research by Hanson in 1992 found that people are influenced and affected by their schools environment, and McGuffey in 1982 found that appropriate renovation and systematically controlled school environment can enhance the learning process. Finally, this study supports Edwards 1991 research that suggests buildings should be renovated to use the latest technologies and innovations in order to stress the relevance of student achievement. This study differs from previous studies in that it focuses on a particular facility improvement and its effect on a school's cost efficiency analysis to determine monetary and life-cycle benefits. Secondly, the study surveyed teachers and

administrators to collect ratings and comments on their lockerless campus in regard to its safety, security, and learning environment. The presentation of this study results will add to the debate over the value of a lockerless campus.

Today's educational practices are focused on results based accountability. Policy makers measure accountability by student achievement versus the cost associated with high achievement. This is the debate that occurs in the Texas legislature today concerning educational adequacy. Consequently, school funds will be issued, expanded, and evaluated on a cost per pupil adequacy scale that Texas refers to as Weighted Average Daily Attendance (WADA). The WADA accounting process designed by the Texas Legislature is precise, to the point of hourly measurements, over the length of a one hundred and eighty day school year. This study proves that lockerless schools are accountable for facility expenditures by reducing new construction cost and extending operating life-cycle efficiencies through the elimination of lockers in academic corridors. Lockerless school savings of \$335 per student and \$402,000 per campus of 1200 students are significant (Table E). Today most secondary school construction projects are in the tens of millions of dollars. Building lockerless will save over two percent on this total campus cost. In new construction savings of close to a half a million dollars per campus will allow facility planners the option to build more economically or expand the project to enhance the campus.

When renovating to a lockerless school initial cost do not result in savings, but operating life-cycle efficiencies of \$5,599.62 annually will eventually result in savings of

\$84,476.50 for a campus of 1200 students over twenty years. A new campus will realize \$111,992.80 in operational life-cycle benefits over twenty years (Table G Analysis).

Lockerless schools cost efficiency in new construction, renovation, and operations represent savings which are not possible when building a traditional school with lockers.

The incident of targeted school violence has increased over the last thirty years and will probably continue to increase as the number of secondary students and campuses grow. These high profile targeted school-based attacks result in increased fear among students, parents, and educators. In the wake of these attacks, fear of future targeted school violence has become a driving force behind the efforts of school officials, law enforcement professionals and parents to identify steps that can be taken to prevent incidents of violence in their schools. (Vossekuil, 2002, p. 7)

This study provides evidence that the lockerless policy can be practiced in order to improve campus safety and security. The survey evaluating lockerless schools concluded that teachers and administrators agree by a margin of three to one that their campus is safer and more secure without lockers. Survey respondents agreed three to one that their lockerless schools reduced the occurrence of contraband, which includes alcohol, tobacco, drugs, and weapons. Survey respondents agreed two to one that their lockerless school reduced the occurrence of violence, which includes fights, student conflicts, and bullying. Survey respondents agree two to one that the occurrence of student tardies, theft, and lost personal property are less in their lockerless schools. Survey respondents agree seven to one that their lockerless campus hallways are easier to monitor and secure, have better visibility and egress or evacuate quicker. Survey

respondents were split on whether backpacks cause student back injury. Table W charts the total statement responses in the category of Safety and Security.

Table W- Survey Category A: Safety and Security

Statements by Sub-Topic	Rating	Rating % for All Surveyed and Administrators
1. Lower occurrence of drugs	A/SA	-----67.3 -----95.2 A
	SD/D	-----32.7 ----4.8 A
2. Lower occurrence of weapons	A/SA	-----76.9 -----90.0 A
	SD/D	-----23.1 -----10.0 A
3. Lower occurrence of contraband	A/SA	-----73.1 -----95.0 A
	SD/D	-----26.9 ----5.0 A
14. Ease of drug search	A/SA	-----83.6 -----100 A
	SD/D	-----16.4 0 A
Sub-Topic: School Contraband	A/SA	-----75.3 -----95.1 A
	SD/D	-----24.7 ----4.9 A
9. Lower occurrence of student fights	A/SA	-----61.8 -----75 A
	SD/D	-----38.2 -----25 A
10. Lower occurrence of student conflict	A/SA	-----67.9 -----81 A
	SD/D	-----32.1 -----19 A
11. Lower occurrence of bullying	A/SA	-----57.9 -----63.2 A
	SD/D	-----42.1 -----36.8 A
Sub-Topic: School Violence	A/SA	-----62.6 -----73.4 A
	SD/D	-----37.4 -----26.6 A
6. Lower occurrence of lost textbooks	A/SA	-----65.9 -----73.7 A
	SD/D	-----34.1 -----26.3 A
7. Lower occurrence of damaged textbooks	A/SA	-----64.7 -----68.4 A
	SD/D	-----35.3 -----31.6 A
Sub-Topic: School Textbooks	A/SA	-----65.3 -----71.1 A
	SD/D	-----34.7

		-----28.9 A
4. Lower occurrence of student property theft	A/SA	-----67.7 -----85.7 A
	SD/D	-----32.3 -----14.3 A
5. Lower occurrence of student tardies	A/SA	-----62.7 -----55 A
	SD/D	-----37.3 -----45 A
8. Lower occurrence of student lost properties	A/SA	-----69.7 -----75 A
	SD/D	-----30.3 -----25 A
Sub-Topic: Student Concerns	A/SA	-----66.7 -----72.1 A
	SD/D	-----33.3 -----27.9 A
12. Easier student hall movement	A/SA	-----91.9 -----95.5 A
	SD/D	---8.1 --4.5 A
13. Quicker evacuation	A/SA	-----78.5 -----85 A
	SD/D	-----21.5 -----15 A
16. Easier hall monitoring	A/SA	-----89.3 -----95.5 A
	SD/D	-----10.7 --4.5 A
17. Improved hallway visibility	A/SA	-----91.9 -----95.5 A
	SD/D	---8.1 --4.5 A
18. Easier building security	A/SA	-----86.0 -----100 A
	SD/D	-----14.0 0 A
Sub-Topic: Corridor Monitoring and Egress	A/SA	-----87.8 -----94.3 A
	SD/D	-----12.2 --5.7 A
15. Backpacks cause student injury	A/SA	-----47.1 -----45 A
	SD/D	-----52.9 -----55 A
Total Results for Category A: Safety and Security	A/SA	-----73.0 -----82.5 A
	SD/D	-----23.0 -----17.5 A
*_ indicates statistical significance		* "A" represents Administrator Responses

Psychological and physiological studies on how the brain learns have revealed new insight about teaching and learning environments. This research has provided relevant information to school administrators and architects about the schools we design that provide most of the environment in which a child's brain learns. Past research has demonstrated that the proper climate, comfort, and organization of the schools environment can enhance learning (Chan, 1998; Ayers, 1999; Jenson, 2003). Other research indicates a negative effect on learning by distractions, noise, and problems. (Berg, 1996; Vecers, 2000; Evans, 2001).

This study provides evidence that the lockerless policy can aid in improving many aspects of a school's learning environment. The survey evaluating lockerless schools concluded that teachers and administrators agree by a margin of two to one that their campus learning environment has improved without lockers. Survey respondents agree four to one that students feel secure and less stressful in the hallways, but disagree three to one that attendance is improved by the comforts of a lockerless environment.

Survey respondents agree four to one that the climate of their lockerless school is cleaner, quieter, less destructive, and easier for teachers to egress. Survey respondents agree two to one that the daily student academic organization process is better, but were split on whether homework was turned in more often or if students came to class better prepared. Survey respondents disagreed about two to one that their lockerless school caused problems for students in regard to jackets, lunches, and personal items. Table X charts the total statement responses in the category of Learning Environment.

Table X- Survey Category B: Learning Environment

Statements by Sub-Topic	Rating	Rating % for All Surveyed and Administrators
19. Lower occurrence of absences	A/SA	-----27.2 -----37.5 A
	SD/D	-----72.8 -----62.5 A
22. Secure student hallways	A/SA	-----80.1 -----90.5 A
	SD/D	-----19.7 -----9.5 A
26. Less stressful passing periods	A/SA	-----85.1 -----90.9 A
	SD/D	-----14.9 -----9.1 A
Sub-Topic: Student Comfort	A/SA	-----68.1 -----76.3 A
	SD/D	-----31.9 -----23.7 A
20. Quiet hallways	A/SA	-----87.1 -----100 A
	SD/D	-----12.9 0 A
21. Cleaner hallways	A/SA	-----87.8 -----100 A
	SD/D	-----12.2 0 A
24. Less class distraction	A/SA	-----74.3 -----90.9 A
	SD/D	-----25.7 -----9.1 A
25. Less students in halls during class	A/SA	-----73.5 -----81.8 A
	SD/D	-----26.5 -----18.2 A
27. Ease of teacher egress between class	A/SA	-----82.5 -----95.2 A
	SD/D	-----17.5 -----4.8 A
Sub-Topic: School Climate	A/SA	-----81.1 -----93.6 A
	SD/D	-----18.9 -----6.5 A
23. Students come to class better prepared	A/SA	-----47.4 -----68.2 A
	SD/D	-----52.6 -----31.8 A
28. More homework completed	A/SA	-----49.1 -----61.9 A
	SD/D	-----50.9 -----38.1 A
24. Better student organizational process	A/SA	-----67.5 -----81 A
	SD/D	-----32.5 -----19 A

Sub-Topic: Student Organization	A/SA	-----52.3 -----70.5 A
	SD/D	-----47.7 -----29.7 A
30. Problems with coats and jackets	A/SA	-----33.6 -----40.9 A
	SD/D	-----66.4 -----59.1 A
31. Problems storing student lunches	A/SA	-----38.9 -----42.9 A
	SD/D	-----61.1 -----57.1 A
32. Problems storing student personal property	A/SA	-----48.0 -----50 A
	SD/D	-----52.0 -----50 A
Sub-Topic: Student Problems	A/SA	-----40.3 -----44.6 A
	SD/D	-----59.7 -----55.4 A
Total Results for Category B: Learning Environment	A/SA	-----68.2 -----76.6 A
	SD/D	-----31.8 -----23.4 A
*_ indicates statistical significance		* "A" represents Administrator Responses

Implications

This study has implications for those schools that have adapted the lockerless policy and schools that are considering building or renovating secondary schools.

1. Campuses that have converted to a lockerless environment can identify areas of benefit and controversial situations in order to better evaluate their lockerless policy.
2. School facility planners will have cost, security, and environment findings regarding the operations of a lockerless school. Their information will add to the discussions when determining whether or not to build or remodel without lockers.

3. District administrators should be interested in any school improvement plan that will save money, as well as, improve security and the learning environment of their secondary school campuses.
4. Campus administrators should be interested in the qualities of lockerless schools for security improvements and potential learning environment benefits. Everyone who works at lockerless schools can realize efficiency benefits from the absence of problems and extra tasks generated by lockers.
5. Teachers, parents, and students will have research data to help them understand the reasoning behind the lockerless school policy. Tradition often squelches new innovative educational practices, especially if dramatic changes are required.

Nationally, secondary schools located in the sunbelt from California to Florida have adopted the lockerless school policy. Some tried it for one year and then went back to lockers because of parent pressure, an administrative change, or lack of classroom textbooks. Many more schools have changed to lockerless and would never consider changing back to lockers. This study offers pertinent information to the debate about lockerless schools that all secondary campus stakeholders should have an interest in.

Limitations

The process of changing to a lockerless campus is complex, involved, and requires years in transition. The school districts chosen for the survey all have successfully completed this process primarily due to the dedication of campus administrators who were committed to the policy. All twelve schools are not identical in their practice of being lockerless but all have completed the change process.

Consequently, this study only evaluated the end results of a lockerless campus and disregards any of the controversy associated with changing a school so drastically. There is a political cost associated with changing the status-quo that this study only slightly investigates through the disagreeing comments.

Differences in new construction square footage cost, renovation cost, operation cost, product cost, maintenance cost, labor cost, and textbook cost exist from one school district to another and vary greatly according to location and availability of goods and services. This study offers only a formula for determining cost/benefit and life-cycle analysis. Each school district considering the lockerless process should use their cost to calculate potential savings.

As with any survey, the reliability of the survey results depends on the quality of the survey and the person filling out the form. Since this survey only interviewed volunteering, experienced lockerless school teachers, many teachers from each school could not render their opinion. Many other teachers decided not to volunteer even though they were qualified. It was impossible to determine the rate of response since the number of qualified volunteers per campus was not obtained. Finally, the qualitative information obtained from the comment section was queried with little direction and no redirection from the survey. Comments were randomly made on the safety/security category and the learning environment category. Those comments often integrated many ideas concerning different statements and crossed referenced categories. This made the qualitative data difficult to group for analysis.

Recommendation for Further Study

The perfect school does not exist. Every school has problems, shortcomings, challenges, nay-sayers, bureaucracy, glass ceilings, economic woes, and so on. Therefore, there is not a model for designing the perfect school. Schools evolve, mature, grow, and change over time to fit the needs of their unique communities. Successful efforts to improve schools always address the concerns and timing of the stakeholders. Good school administrators are proactive in the change process rather than being reactive. Deciding to be a lockerless school could be the right proactive change for many secondary school campuses.

1. Every campus that changes to lockerless or implements another innovation should enact a program evaluation. This micro-study will help the campus administrator make adjustments or sunset the policy.
2. This study could be replicated as an in-depth case study of one lockerless campus going through the first two years of the change process. The study could explore the politics, indoctrination procedures, staff development, community and student opinions, and closely correlate cause and effects.
3. This study could be repeated in other states. Texas is not the only state where legislatures are concerned about getting more for their educational dollar.
4. This study could be broadened to gather information from both ends of the facility spectrum. The study only interviewed teachers and administrators. A broader study would include interviews of architects, contractors, students, parents, and community support personnel like police, doctors, and nurses.

Everyone has an image, a definition, and emotions about their school. The word school is loaded with meaning for all of us. This conceptualization of the school in our minds, in and of itself, has become the primary obstacle to school change. Today secondary schools are burdened with tradition. This study simply hopes to lighten the load that has been piled on secondary educators in the name of progress. Our secondary schools cannot continue to add the latest educational technologies unless we eliminate useless and outdated ones.

Administrators have to make their existing facilities fit the new age demand of sustainability. Today academic technology application requires personal computers. In the future, the price of a laptop computer could be cheaper than a locker and have a better life-cycle. This study questions the need for a locker when organization can be streamlined with a backpack and a PC or Palm Pilot. Why carry a five-pound textbook when a one-ounce CD will do? Why shuffle and transport papers when email and zip drives can carry the work electronically? Lockers are an expensive, antiquated, unsafe hindrance to the learning environment, and have lost their academic application in modern schools, due to changes in educational technologies.

Appendix A

LOCKERLESS SCHOOLS SURVEY DIRECTIONS

Please follow these steps in completing this survey:

First- Please complete this survey **if** you have taught in any school with student lockers. If you have not, disregard this survey.

Second- Read pages 1 & 2 of the Informed Consent, then print your name, sign, and date page 3 on “Subject” lines.

Third- When completing the survey, compare your experiences in schools with student lockers to your current school.

Fourth- Return finished Survey and Informed Consent to designated boxes

This survey should only take 10-15 minutes to complete. Your prompt attention will be greatly appreciated.

Lockerless School Survey (Appendix A)

Rate your lockerless schools in regard to the criterion statements using the following scale: 0- Not applicable, 1- Strongly Disagree, 2- Disagree, 3- Agree, 4- Strongly Agree.

Category A: Safety and Security

Criterion Statements:

1. ____ My School has a lower occurrence of drugs without lockers than it did with lockers.
2. ____ My School has a lower occurrence of weapons without lockers than it did with lockers.
3. ____ My School has a lower occurrence of contraband (pornography, tobacco, alcohol) without lockers than it did with lockers.
4. ____ My School has a lower occurrence of theft regarding student personal property without lockers than it did with lockers.
5. ____ My School has a lower occurrence of tardy students without lockers than it did with lockers.
6. ____ My School has a lower occurrence of lost text books without lockers than it did with lockers.
7. ____ My School has a lower occurrence of damaged text books without lockers than it did with lockers.

- 8.____ My School has a lower occurrence of lost student personal property without lockers than it did with lockers.
- 9.____ My School has a lower occurrence of student fights without lockers than it did with lockers.
- 10.____ My School has a lower occurrence of student conflict during the passing period without lockers than it did with lockers.
- 11.____ My School has a lower occurrence of bullying in the hallways without lockers than it did with lockers.
- 12.____ During the passing period there is easier student movement in the halls without lockers than with lockers.
- 13.____ When conducting a safety drills your school evacuates quicker without lockers than with lockers.
- 14.____ Conducting a drug search is easier in a school without lockers than in a school with lockers.
- 15.____ Student back packs are heavier and cause back injury in a school without lockers as opposed to a school with lockers.
- 16.____ My school's hallways are more easily monitored without lockers than with lockers.
- 17.____ Visibility of students in the hallway is improved without lockers than with lockers.
- 18.____ The school building is easier to secure without lockers than with lockers.

Comments:

Category B: Learning Environment

Criterion Statements:

19. ___ My School has a lower occurrence of absences without lockers than it did with lockers.
20. ___ My schools hallways are quieter without lockers than with lockers.
21. ___ My schools hallways are cleaner without lockers than with lockers.
22. ___ Students are more secure in hallways without lockers than in hallways with lockers.
23. ___ Students come to class better prepared in a school without lockers than in a school with lockers.
24. ___ Teachers have less class distractions in a school without lockers than with lockers.
25. ___ Students are in the halls less during class in a school without lockers than with lockers.
26. ___ The passing period is less stressful for students in a school without lockers than with lockerless.
27. ___ Teachers move easier between classes in a school without lockers than with lockers.
28. ___ More homework is completed because the students have a text book that stays at home in a lockerless school.
29. ___ The daily academic organizational process used by a student in a lockerless school aids the learning process more than using a locker to organize student

academic materials.

30.____ Students wearing coats and jackets are more of a problem in a school without lockers than with lockers.

31.____ Storing student lunches is more a problem in a school without lockers than with lockers.

32.____ Storing student personal items is more a problem in a school without lockers than with lockers.

Comments: _____

Appendix B

IRB# _____

Informed Consent to Participate in Research

The University of Texas at Austin

You are being asked to participate in a research study. This form provides you with information about the study. The Principal Investigator (the person in charge of this research) or his representative will also describe this study to you and answer all your questions. Please read the information below and ask questions about anything you don't understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits to which you are otherwise entitled.

Title of Research Study: Evaluating lockerless schools

Principal Investigator and Telephone Number:

Principal Investigator, James Bartosh- with The University of Texas at Austin
(512) 859-2613 fax (512) 859-2446

Faculty Sponsor, Mike Thomas- with Office of Educational Administration at
The University of Texas at Austin # (512) 475-8578 fax (512) 475-8590

Funding Source: James Bartosh funds this project

What is the purpose of this study?: The purpose of this study is to evaluate the effectiveness of lockerless schools concerning cost efficiency, security, and learning climate.

What will be done if you take part in this research study?: You will receive a questionnaire. The questionnaire takes about 20 minutes to fill out. You will return the questionnaire to James Bartosh and the information will be used in conjunction with cost analysis data to evaluate the effectiveness of lockerless school facilities.

What are the possible discomforts and risks?: The only discomfort is the time it will take to fill out the questionnaire. There may be risks that are unknown at this time. If you wish to discuss the information above, or any other risks you may experience, you may ask questions now or call James Bartosh at the numbers listed above.

What are the possible benefits to you and to others?: Evaluating the lockerless school experience can benefit educators in planning future school facilities. There are no direct benefits to you by this study.

If you choose to take part in this study will it cost you anything?: No, it will cost you nothing.

Will you receive compensation for your participation in this study?: No, you will not receive compensation.

What if you are injured because of the study?: There is virtually no likelihood of injury due to this study. No treatment will be provided for research related injury and no payment can be provided in the event of a medical problem.

If you do not want to take part in this study, what other options are available to you?: Participation in this study is entirely voluntary. You are free to refuse to be in the study, and your refusal will not influence current or future relationships with the The University of Texas at Austin or your current school district.

How can you withdraw from this research study?: If you wish to stop your participation in this research study for any reason, you should contact the Office of Education Administration or James Bartosh. You are free to withdraw your consent and stop participation in this research study at any time without penalty or loss of benefits for which you may be entitled. Throughout the study, the researchers will notify you of new information that may become available and that might effect your decision to remain in the study. In addition, if you have questions about your rights as a research participant,

please contact The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects.

How will your privacy and the confidentiality of your research records be protected?: Authorized persons from The University of Texas at Austin and The Instructional Review Board have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. If the research project is sponsored then the sponsor also has the legal right to review your research records. Otherwise, your research records will not be released without your consent unless required by law or a court order.

If the results of this research are published or presented at scientific meetings, your identity will not be disclosed.

Will the researcher benefit from your participation in this study?: There will be no benefit beyond publishing or presenting the results.

Signatures:

As a representative of this study, I have explained the purpose, the procedure, the benefits, and the risks that are involved in this research study:

Signature and printed name of person obtaining consent

Date

You have been informed about this study's purpose, procedures, possible benefits, and risks, and you have received a copy of this Form. You have been given the opportunity to ask questions before you sign, and you have been told you can ask other questions at any time. You voluntarily agree to participate in this study. By signing this form, you are not waving any of your legal rights.

Printed name of Subject

Date

Signature of Subject

Date

Signature of Principal Investigator

Date

Appendix C

Table AA: Comparison of Means

Question	teacher	N	Mean	Std. Deviation	Std. Error Mean
q1	No	21	0.952	0.218	0.048
	Yes	190	0.642	0.481	0.035
q2	No	20	0.900	0.308	0.069
	Yes	192	0.755	0.431	0.031
q3	No	20	0.950	0.224	0.050
	Yes	192	0.708	0.456	0.033
q4	No	21	0.857	0.359	0.078
	Yes	202	0.658	0.475	0.033
q5	No	20	0.550	0.510	0.114
	Yes	205	0.634	0.483	0.034
q6	No	19	0.737	0.452	0.104
	Yes	198	0.652	0.478	0.034
q7	No	19	0.684	0.478	0.110
	Yes	196	0.643	0.480	0.034
q8	No	20	0.750	0.444	0.099
	Yes	201	0.692	0.463	0.033
q9	No	20	0.750	0.444	0.099
	Yes	187	0.604	0.490	0.036
q10	No	21	0.810	0.402	0.088
	Yes	200	0.665	0.473	0.033
q11	No	19	0.632	0.496	0.114
	Yes	190	0.574	0.496	0.036
q12	No	22	0.955	0.213	0.045
	Yes	212	0.915	0.279	0.019
q13	No	20	0.850	0.366	0.082
	Yes	180	0.778	0.417	0.031
q14	No	21	1.000	0.000	0.000
	Yes	198	0.818	0.387	0.027
q15	No	20	0.450	0.510	0.114
	Yes	188	0.473	0.501	0.037
q16	No	22	0.955	0.213	0.045
	Yes	211	0.886	0.318	0.022
q17	No	22	0.955	0.213	0.045
	Yes	212	0.915	0.279	0.019
q18	No	20	1.000	0.000	0.000
	Yes	202	0.847	0.361	0.025
q19	No	16	0.375	0.500	0.125
	Yes	136	0.257	0.439	0.038

q20	No	21	1.000	0.000	0.000
	Yes	203	0.857	0.351	0.025
q21	No	21	1.000	0.000	0.000
	Yes	209	0.866	0.341	0.024
q22	No	21	0.905	0.301	0.066
	Yes	190	0.789	0.409	0.030
q23	No	22	0.682	0.477	0.102
	Yes	189	0.450	0.499	0.036
q24	No	22	0.909	0.294	0.063
	Yes	199	0.724	0.448	0.032
q25	No	22	0.818	0.395	0.084
	Yes	204	0.725	0.447	0.031
q26	No	22	0.909	0.294	0.063
	Yes	187	0.840	0.368	0.027
q27	No	21	0.952	0.218	0.048
	Yes	191	0.812	0.392	0.028
q28	No	21	0.619	0.498	0.109
	Yes	191	0.476	0.501	0.036
q29	No	21	0.810	0.402	0.088
	Yes	185	0.659	0.475	0.035
q30	No	22	0.409	0.503	0.107
	Yes	195	0.303	0.461	0.033
q31	No	21	0.429	0.507	0.111
	Yes	190	0.384	0.488	0.035
q32	No	22	0.500	0.512	0.109
	Yes	203	0.478	0.501	0.035

Table AB: Independent Sample *t* test results

Independent Samples Test							
Question Number	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
q1	5.257	45.805	0.000	0.310	0.059	0.191	0.429
q2	1.917	27.444	0.066	0.145	0.076	-0.010	0.300
q3	4.038	38.285	0.000	0.242	0.060	0.121	0.363
q4	2.335	27.886	0.027	0.199	0.085	0.024	0.373
q5	-0.740	223.000	0.460	-0.084	0.114	-0.308	0.140
q6	0.747	215.000	0.456	0.085	0.114	-0.140	0.310
q7	0.358	213.000	0.720	0.041	0.115	-0.186	0.269
q8	0.540	219.000	0.590	0.058	0.108	-0.155	0.272
q9	1.380	24.231	0.180	0.146	0.106	-0.072	0.364
q10	1.538	26.174	0.136	0.145	0.094	-0.049	0.338

q11	0.485	207.000	0.628	0.058	0.119	-0.177	0.293
q12	0.643	232.000	0.521	0.039	0.061	-0.081	0.160
q13	0.743	198.000	0.458	0.072	0.097	-0.119	0.264
q14	6.616	197.000	0.000	0.182	0.027	0.128	0.236
q15	-0.198	206.000	0.843	-0.023	0.118	-0.256	0.209
q16	1.353	31.720	0.186	0.068	0.050	-0.035	0.171
q17	0.643	232.000	0.521	0.039	0.061	-0.081	0.160
q18	6.036	201.000	0.000	0.153	0.025	0.103	0.204
q19	1.000	150.000	0.319	0.118	0.118	-0.115	0.350
q20	5.802	202.000	0.000	0.143	0.025	0.094	0.191
q21	5.672	208.000	0.000	0.134	0.024	0.087	0.181
q22	1.601	28.870	0.120	0.115	0.072	-0.032	0.263
q23	2.150	26.644	0.041	0.232	0.108	0.011	0.454
q24	2.637	32.933	0.013	0.185	0.070	0.042	0.329
q25	1.032	27.166	0.311	0.093	0.090	-0.092	0.277
q26	0.854	207.000	0.394	0.070	0.081	-0.091	0.230
q27	2.541	36.241	0.015	0.141	0.055	0.028	0.253
q28	1.246	24.669	0.225	0.143	0.114	-0.093	0.379
q29	1.588	26.761	0.124	0.150	0.095	-0.044	0.344
q30	1.019	215.000	0.309	0.107	0.105	-0.100	0.313
q31	0.394	209.000	0.694	0.044	0.113	-0.178	0.266
q32	0.197	223.000	0.844	0.022	0.113	-0.200	0.244

Questions in bold are statistically significant at the $p < .05$ level

Levene's test for the homogeneity of variances was employed to determine the correct t test results to accept.

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Vita

James Edward Bartosh Jr. was born in Foft Sill, Oklahoma on September 11, 1954 to Patricia Jane Bartosh and James E. Bartosh Sr.. James is the oldest of five children. After graduating from Taylor High School, Taylor, Texas in 1972, James attended North Texas State University for three semesters and then transferred to the University of Texas at Austin where he graduated with a Bachelors of Science degree in 1977 with a concentration in Physical Education and Biology. For five years James taught and coached in Texas at Del Valle, Beeville, and Tuloso Midway School Districts. In 1982 he moved to his next teaching assignment in Canyon, Texas where he enrolled in Graduate School at West Texas State University. In 1985 he moved to Lazbuddie, Texas to be the Athletic Director for Lazbuddie ISD. James was awarded a Masters Degree in Educational Administration in 1987. That year in 1987 he moved back home where he taught, coached, and later became an assistant principal at Taylor High School. In 1994 he became the Principal at Granger ISD PK-12. In 1995 he enrolled in Graduate School at Texas State University where he received his Superintendent's Certification in 1997. In February of 1995 he became the Superintendent of Granger ISD. He was accepted into the Cooperative Superintendency Doctorate Program at The University of Texas at Austin in 2003. His family includes his wife Dana who is a Licensed Practicing Counselor and his daughters Jennifer, Haley, and Abby.

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This treatise was typed by my oldest daughter Jennifer.