Advancing School Environments Through Research Synthesis in Design

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ADVANCING SCHOOL ENVIRONMENTS THROUGH RESEARCH SYNTHESIS IN DESIGN
While many local Georgia middle schools are still being constructed based on antiquated research and design strategies, this thesis project aims to take advantage and respond to all three of these areas of research: well-being, safety, and learning environment design. These three research areas, well-being, safety, and learning, can mutually inform one another. By identifying components that can be implemented by using similar design elements, like glazing or the form, that respond to all three areas of research, a holistic design can be achieved that simultaneously increases student learning, safety and promotes physical activity.
DEDICATION

This book is dedicated to my family because of their unending support and help throughout my entire collegiate career. I could not have done any of this without their guidance and advice when things got hard. I dedicate this to Nathaniel Nalley for loving me always, being one of the best listeners I have ever met, and always pushing me to do my best. I also dedicate this to all of my longtime friends for constantly encouraging me to pursue Jesus and strive to be more like Him. Love you all.

Lastly, I would like to dedicate this book to my Lord and Savior, Jesus Christ. All the glory to God.

ACKNOWLEDGMENTS

This Thesis would not be possible without the guidance of my Thesis Advisor, Professor Kathryn Bedette.

Professor Bedette, thank you for your dedication, advice, and ability to help me understand the potential of my project. Your encouragement has been incredibly significant to me.

I would also like to acknowledge all of my brothers of Alpha Rho Chi and their endless support and mentorship.
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Antiquated school designs are still often being used today. Instead, how can schools be designed in a way that is cost efficient, but also extremely responsive to what recent research has revealed?
ABSTRACT

AIR CIRCULATION
CONNECTIVITY
NATURAL LIGHT
MOVEMENT
SURVEILLANCE
CONNECTION TO NATURE

WHAT IS AN ELEMENT?

DIFFERENT COMPONENTS THROUGH ONE DESIGN ELEMENT

Recent research explains that school design impacts more than just learning. According to a Harvard University Public Health survey, “over half [of American children] are on a track that will lead to obesity by the time they are thirty-five” years old. Not only that but the National Education Association explains “an estimated 160,000 U.S. children miss school every day due to fear of attack or intimidation by another student,” and forty-two percent of reported bullying incidents occur in hallways or stairwells based on Statistic’s findings. On a more positive note, a recent study done by University of Oxford Professor Peter Barrett, has explained that the physical learning environment design can improve student learning by sixteen percent.

Now, looking at these three different statistics, all of them have something in common: they can all be influenced by the physical design of a school. While schools are still being constructed based on antiquated research and design strategies, this thesis project aims to take advantage and respond to all three of these areas of research: well-being, safety, and learning environment design.

The project began with the analysis of a newly constructed school that follows antiquated research methods: East Cobb Middle School. This proposed project will use the same site as it’s state prior to the current school’s construction in order to compare the proposed school design to the current one. This will reveal how the three areas of research can influence a cost efficient design that is more successful for learning.

These three research areas, well-being, safety, and learning, can mutually inform one another. By identifying components that can be implemented by using similar design elements, like glazing or the form, that respond to all three areas of research, a holistic design can be achieved that aids and radically increases student learning, safety and promotes physical activity.
Education is the basis of our society and many people believe that it is the key to a successful future regardless of economic, cultural, or social backgrounds. Education is so vital that every country values it, and it is constantly evolving to match the needs of our current society. Education is a dynamic concept that requires endless research and should be responsive to social and cultural context. As the values in education change, so should the physical environment.

The intent of this project is to question and challenge the implementation of school designs that are based off of antiquated research. Schools should not always default to cell block, square classrooms with little to no windows. If education is so important, shouldn’t the physical design reflect that importance?

Through recent research and studies, it becomes apparent that there are alternate ways of looking at design in order to save money and achieve a healthier, safer learning environment for the children of every community, regardless of economic status.

The intent of this thesis project is to illustrate the influence of recent research in a middle school on an existing site and compare it to a current model of the middle school. By comparing the proposed design to the current school, it should reveal that recent research should be implemented and should also discourage the use of antiquated methods and models.
From researching general ideas in regard to middle school education, three areas emerged that were found to be most important: safety, well-being, and the learning environment. All three contribute to a successful environment to house and guide teachers, shape students, and encourage growth. Schools should not just provide a space for the functions of a school, but should promote and encourage collaboration, health, social interaction, and safety. Each design decision should focus on key words that have been extracted from the research. The more key words a design decision successfully addresses, the more cost efficient and advantageous the space is for the community, students, and faculty.

\textbf{COMPONENTS [design outcomes]}

- air quality
- natural light
- visible nature
- natural connection
- internal surveillance
- external surveillance
- flexibility
- movement
- connectivity
- adaptability
- materiality
- controlled access
- scale
- separateness
- color
- weaving
- individualization
- curved
- streets
- territorial reinforcement
- collaboration

\textbf{SAFETY}

After analyzing data from 700 American high schools, research “found that safety and security measures in high schools lead to results that hinder teaching and learning.”

\textbf{WELL-BEING}

A study from Harvard University’s T.H. Chan School of Public Health states “over half the [students] are on a track that will lead to obesity by the time they are thirty-five.”

\textbf{LEARNING ENVIRONMENTS}

Evidence shows that physical elements in primary schools do impact overall learning. “This explains 1/4 of the variation in the overall progress over a year of the 3766 pupils indicated in the study.”
The chosen precedents each carry strengths or overlaps that contribute to the recent research on learning environments, safety, and well-being. Precedents have been assessed based on the physical appearance of the following key words that support the three areas of research. In some unique cases, a key word can fulfill more than one area of analysis. All together, each precedent contains many elements that can be applied to the chosen site in order to create a new school design that successfully acknowledges the research, the desired program, and the existing site conditions.

**S A F E T Y**
- **curved streets:** streets that are curved to maximize visibility
- **territorial reinforcement:** reinforcement of areas that are private vs public
- **controlled access:** specific entrances/layers for protection against threats
- **internal surveillance:** interior transparency to deter undesired behavior
- **external surveillance:** exterior transparency to spot threats
- **barriers:** physical elements that protect against threats
- **private vs public:** spaces that are separated based on private or public space
- **separation:** separation of spaces using physical elements

**W E L L - B E I N G**
- **air quality:** access to fresh air ( operable windows, air ventilation)
- **movement:** spaces or topography that encourages movement
- **temperature:** physical elements that can be changed to fit the needs of different learning styles
- **color:** vibrant colors are used
- **materiality:** materials, space organization, or color that assist students navigate the school
- **scale:** ceiling heights and varying scales are used without different elements
- **wayfinding:** vibrant colors are used
- **individualization:** spaces that can be personalized or fit the needs of the individual
- **collaboration:** space for children to work together

**L E A R N I N G E N V I R O N M E N T**
- **natural light:** direct sun light is evident
- **visible nature:** natural elements are visible
- **natural connection:** physical connection to natural elements
- **flexibility:** ability to use space for multipurpose
- **adaptability:** physical spaces can change to fit the needs of different learning spaces
- **materiality:** the use of different materials to stimulate
- **scale:** ceiling heights and varying scales are used without different elements
- **color:** vibrant colors are used
- **wayfinding:** materials, space organization, or color that assist students navigate the school
- **individualization:** spaces that can be personalized or fit the needs of the individual
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**Defining the Components**
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**How Do We Assess?**
- **Strong:** which areas of research does the element respond to?
- **Weak:** how many components?

**Precedent**
- **Precedent**
- **Precedent 1.3**
- **direct sun light is evident**
- **natural elements are visible**
- **physical connection to natural elements**
- **ability to use space for multipurpose**
- **adaptability:** physical spaces can change to fit the needs of different learning spaces
- **materiality:** the use of different materials to stimulate
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BJARKE INGELS GROUP | ARLINGTON PUBLIC SCHOOL

FOCUS: Bjarke Ingels Group designed this school to seem like it was one level by utilizing the adjacencies to the street in an urban environment. This school separates public versus private space to maintain security within the school while also engaging the street. The form plays a vital role in safety and activity.

SEATING
- Natural connection
- External surveillance
- Connectivity
- Natural light
- Visible nature
- Movement
- Air quality
- External surveillance
- Flexibility
- Connectivity
- Natural light
- Visible nature
- Movement
- Air quality

GREENERY

OPERABLE GLAZING
- Natural connection
- External surveillance
- Connectivity
- Natural light
- Visible nature
- Movement
- Air quality

1.3 PRECEDENTS

PUBLIC V. PRIVATE
- Separation
- Verticality
- Movement
- Connectivity
- Natural light
- Natural connection
- Flexibility
- Controlled access

FORM & ENVELOPE

GREEN SPACE

FOCUS: Due to the events that occurred several years ago, this firm focused on designing a school that took safety as a high priority. They integrated several of the safety features into environmental factors to keep the integrity of the environment.

**THEOREM**

- SIDEYARDS
- OUTDOOR CLASSROOMS
- SKYLIGHTS
- WINDOWS
- ENTRY
- LANDSCAPE
- CURB

**RESPONSIVE ELEMENTS**

- SIDEYARD
- OUTDOOR CLASSROOM
- SKYLIGHT
- WINDOWS
- ENTRY
- LANDSCAPE
- CURB
DAKE WELLS ARCHITECTURE | REEDS SPRING MIDDLE SCHOOL 
REEDS SPRING, MO 2017

FOCUS: Reeds Spring Middle looks closely into flexibility of space and movement. It has a vertical form and focuses on the movement in between spaces and how this can be maximized to function properly. Materiality is also carefully considered as it changes in the design.

THEOREM

STAIRS
adaptability
movement
connectivity
internal surveillance

MATERIAL
materiality
wayfinding

WOOD SLATS
porosity

SPLASH
apertures

SKYLIGHTS
separation

RESPONSIVE ELEMENTS

DELPHI HEIGHT
natural light
temperature
scale

OPERABLE GLASS PARTITIONS
internal surveillance

HALLWAY WIDTH
scale

1.3 PRECEDENTS
VERSTAS ARCHITECTS | SAUNALANTI SCHOOL
ESPOO, FINLAND 2012

FOCUS: The Saunalanti school focuses on the context connection and does a good job at engaging the environment around the building as well as inside. The form and the use of apertures proves to be important for safety and quality of the physical environment.

WINDS
- natural light
- ventilation
- scale
- connectivity
- visible nature
- natural connection
- verticality

INTERNAL WINDOW
- natural light
- ventilation
- scale
- connectivity
- individualization

GLAZING
- external surveillance
- natural light
- air quality*
- visible nature
- natural connection
- scale
- individualization

ENTRY
- controlled access
- external surveillance
- territorial reinforcement

LANDSCAPE
- movement
- external surveillance
- verticality

SIDEWALK
- external surveillance
- scale
- individualization

SEATING
- adaptability
- flexibility
- movement
- individualization

RESPONSIVE ELEMENTS
MAHLUM | WILKES ELEMENTARY SCHOOL
BAINBRIDGE ISLAND, WA 2012

FOCUS: The circulation in this design is notable for its transparency and movement in between spaces. It’s flexible and also adds a degree of individualization that helps students feel more comfortable in their environment.

THEOREM

INTERNAL WINDOW
- Transparency
- Flexibility
- Movement
- Individualization

INTERNAL WINDOW
- Transparency
- Flexibility
- Movement
- Individualization

SEATING
- Flexibility
- Adaptability
- Movement
- Individualization

WINDOWS
- Scale
- External surveillance
- Natural light
- Air quality

DISPLAYS
- Individualization

LANDSCAPE
- Flexibility
- Movement
- Territory
- Reinforcement

GLAZING & WINDOWS
- Visibility
- Natural light
- Air quality
- Natural connection
- Scale
- Individualization

RESPONSIVE ELEMENTS
FOCUS: This project focuses on visibility and verticality between spaces. Sectionally, the project reveals the visibility between levels, rooms, and inside versus outside. Color and materiality are also prevalent. Movement is also highlighted through a variety of seating.

**THEOREM**

- **GLAZING & WINDOWS**
  - External surveillance
  - Internal surveillance
  - Scale
  - Connectivity
  - Separation

- **INTERNAL WINDOW**
  - External surveillance
  - Scale
  - Connectivity
  - Separation

- **SEATING**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

**RESPONSIVE ELEMENTS**

- **GLAZING**
  - External surveillance
  - Internal surveillance
  - Scale
  - Connectivity
  - Separation

- **INTERNAL WINDOW**
  - External surveillance
  - Scale
  - Connectivity
  - Separation

- **SEATING**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **COLOR**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **CEILING HEIGHT**
  - Natural light
  - Temperature
  - Scale

**INTERNAL WINDOW**

- **EXTERNAL WINDOW**
  - External surveillance
  - Scale
  - Connectivity
  - Separation
  - Movement

**SEATING**

- **GLAZING**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **INTERNAL WINDOW**
  - Internal surveillance
  - Scale
  - Connectivity
  - Separation

- **SEATING**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

**CEILING HEIGHT**

- **COLOR**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **INTERNAL WINDOW**
  - Internal surveillance
  - Scale
  - Connectivity
  - Separation

- **SEATING**
  - Flexibility
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  - Movement
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**RESPONSIVE ELEMENTS**

- **GLAZING**
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- **SEATING**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **COLOR**
  - Flexibility
  - Adaptability
  - Movement
  - Individualization

- **CEILING HEIGHT**
  - Natural light
  - Temperature
  - Scale
SYNTHESIS

These precedents prove that using certain design elements can relate to the three areas of research that drive the means for this project: safety, well-being, and the learning environment.

Glazing can achieve multiple goals if used in a strategic way to accommodate the needs of the school. Glazing can provide connections, increase safety through visibility, and contribute to natural light or ventilation to increase overall human comfort. Landscape, seating, and the form can also be intentionally designed to perform in many different ways which allows less money to be spent on technology or more features to accomplish the same goal.
Can the use of the site also respond to all three areas of research? Can the unique topography be advantageous with the implementation of program and access? How can we implement elements that respond to the safety of the entire site?
In order to answer the question of whether or not a comprehensive design can be achieved that better functions and can provide tools for teachers and students to use. The chosen site must have these characteristics in order to be considered:

- The site chosen will be used in its original state for the proposed project and will act as a controlled variable. After the design is finalized, the proposed project and the current, existing project will be compared and contrasted to understand the differences and similarities in the designs. Ideally, the proposed design will reflect recent research and remain close to the current school’s budget to encourage and persuade decision makers to use the new methods and findings to influence newer schools.

**SITE REQUIREMENTS**

- Existing school accessibility
- Available materials + resources
- User group identified
- Currently constructed
- Reflect antiquated research
- Budget known

**SITE INTENT**

**COMPARE + CONTRAST**

- Georgia Online Mapping

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

BUDGET: $28,464,276
Understanding the students is a vital part of this project as it helps identify the user group and give the opportunity to individualize the spaces and introduce a sense of normalcy and possession to the group. The majority of students at the school are African American and low income students who may or may not face constant economic struggles at home or lack fundamental necessities for survival. Homelessness, lack of food and clean water all may be issues that these students must deal with and should be acknowledged during the design of the proposed project.

The zoning and proximity to the school for some of these students could include opportunities for physical activity if students are able to walk to school rather than be dropped off by a parent or ride the bus. The site and the immediate surroundings can be adjusted or analyzed in order to respond to research and provide a more holistic design.
The proposed site is the current site of the school, East Cobb Middle School, and is located on 825 Terrell Mill Road in Marietta, Ga. In order to compare the proposed project with the current one, information about program, budget, user group must be known. Fortunately, all this information regarding East Cobb Middle is accessible and can be used to understand how the proposed project should respond to the site and what it should also implement. The site is close to a park and remains in the midst of several walkable neighborhoods that hold potential for development and design.

2.3 PROPOSED SITE

The site originally had a irregular topography that sloped up towards the south east side of the site. The original site also included a small retention pond with several trees around the site. Fortunately, the site is adjacent to two neighborhoods which can be considered advantageous for the well-being argument, to encourage students to walk to school rather than ride buses or cars.

Currently, the site contains a complex of two different schools, Brumby Elementary School and East Cobb Middle School. It seems that there was a lot of initial site work in order to compensate for the topographical changes that were seen in the original site prior to the construction of the new schools. The retention pond was constructed to accommodate the increase of water which would run off the adjacent parking lot and buildings. The middle school is situated about halfway with the green space for recreational activities placed in the most east side, nearest the neighborhoods.

THE SITE

PROPOSED SITE

BEFORE

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ORIGINAL TO CURRENT CONDITIONS

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THE CONTEXT

The site is located in a residential area which means that it borders several neighborhoods and is connected through sidewalks. Because the school is adjacent to these residential areas, the school’s circulation can easily be designed to encourage the walkability of the site and its surroundings to promote walking to school within a safe environment.

STREET TYPES

The streets surrounding the site are primary corridors. Terrell Mill Road which just lies west of the site has four lanes with crosswalks. There are a few secondary corridors, and dead end corridors populate the area dominantly due to it being a residential area.

THE SITE

- primary corridors
- secondary corridors
- dead end corridors
- site
- general commercial
- limited retail commercial
- general commercial
- neighborhood shopping district
- regional retail commercial
- office and institution
- residential
- park area
SITE CONDITIONS (before construction)

This isovist explains the extents of the many views across the site. The site is populated by several trees and contributes to most of the limitations of view that are evident. In regards to the school that is being proposed, views should be highly considered in order to take advantage of sight lines that could help with surveillance and provide another layer of safety to the children inside the school. Trees are also a great way to provide shade and create natural barriers against cars.

BOUNDARIES

Boundaries are similar to the isovist studies in that they help in understanding constraints across the site and within the site. Trees make up the majority of the internal boundaries and the nearby neighborhoods and street create external boundaries or points to take into consideration for the safety of the students. Boundaries will be necessary to control access points and places of entry into the site.

CIRCULATION

The main vehicular traffic areas are just west of the site. The street adjacent contains four lanes of traffic with about two feet of curb on either side, then the sidewalk. The neighborhoods across the street also have sidewalks which are used daily for the students to get to school.
Safety, well-being, and the physical environment can all be affected by the views or sight lines that are given within the site or in its immediate surroundings. The original site has an interesting topography that enables different views from different areas which can be important for circulation as well as important for consideration as the design of the project pushes forward.

VIEWS ACROSS THE SITE

2.3 PROPOSED SITE
AZIMUTH AND SUN ANGLES

SUN STUDIES

Azimuth and sun angles are important to understand the how to orient and shade the proposed middle school in order to help with cost and comfort within the interior of the building.

SECTION 1 | SUN ANGLES

EQUINOX

MARCH 20 + SEPT. 23

MARCH 20 = MARCH 21

SUN ANGLES

DECEMBER 20 = DECEMBER 21

MILD WINTER SOLSTICE

SUMMER SOLSTICE

MARCH 20 = MARCH 21

DECEMBER 20 = DECEMBER 21

SECTION 1 | SUN ANGLES

STREETSCAPE

Sound studies

THE SITE

80dB

40dB

~ 500’

~ 1,400’

30dB

20’- 0”

12’- 0”

12’- 0”

12’- 0”

12’- 0”

2’- 6”

5’- 0”

5’- 0”

2.3 PROPOSED SITE

2.3 PROPOSED SITE

2.3 PROPOSED SITE

2.3 PROPOSED SITE

SOUND

Sound is important to consider in regards to successful learning environments. Some students may be easily distracted or require a quiet environment. If the building is backed up towards a road or lacks insulation, it could prove to be problematic for several students. The further you place the building away from the street, the more quiet it will be for the students. According to the inverse square law, if the distance from the origin of the sound is doubled, the intensity of sound will drop six decibels.

SOUND

STREETSCAPE

Terrell Mill Road lies just west of the site, and it has the potential to encourage pedestrian activity depending on its design. Currently, the sidewalk is not suitable for students to walk on because they are only two and a half feet away from the four-lane road that remains busy throughout the day. It is imperative that students and the surrounding community feel safe in order to persuade others to use it to exercise or commute to their school.
STREET CONDITIONS

Students need a more efficient way to cross the street whether that be a foot bridge or a better crosswalk design. Sidewalks also need to be positioned further away from the road with a barrier between the pedestrian and the vehicle. Implementing bike lanes and adding trees would be advantageous.

SITE CONCLUSIONS

Overall, the site prior to the construction of East Cobb Middle School contains many opportunities that can be used in a way that responds to all three areas of research and can eliminate some cost concerns. The proposed project will be placed farther from the street on the site for visibility, natural light, and air circulation. The front of the school can be designated for a recreation field where visibility is maximized. Natural barriers, such as trees, can also be heavily implemented towards the entrance of the school for safety barrier, shade, and connecting back to nature from the school’s interior.

BUILDING POSITION

If the structure is situated further back from the road, visibility is increased for safety and noise is reduced for the learning environments.

ACCESS POINTS

The topography offers several ways to control access points to the school while simultaneously taking advantage of the visibility across the site to see threats if they approach the building.

NATURAL BARRIERS

Trees can actively do many things for the safety, well-being, and learning environments for the students. It can provide barriers against threats, create connections to nature, and encourage activities outdoors with shading.
The Process

What is the best way to carefully and intentionally design each element to respond to all these areas of research? How many different components can each element provide?
Be
t
ore
f
or
the
co
struc
tion
of
the
cur
rent
schoo,
the
site
h
ad
sev
er
al
dif
fer
ent
p
os
iti
ve
ch
ar
ac
tri
c
es.
T
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3.1 Case Study Conditions

Before the construction of the current school, the site had several different positive characteristics. There is a grade change that declines towards the main adjacent street, Terrell Mill Road, that can be used for visibility purposes and safety, while also compartmentalizing areas across the site for other programs.

The current school did not take advantage of the existing topography and has separated the play field from the building with a bus lot which could potentially be dangerous for students and it creates discontinuity across the site.

The Process

a. Teacher | Visitor parking
b. Bus loading | Parking
c. Recreation field
d. Retaining wall
e. Adjacent road
f. Sun path

Site Plan

Site Circulation

3.1 Case Study Site Conditions
Based on recent research of safety, well-being, and learning environments, this existing project lacks some of the positive elements that were heavily suggested. Standard materials such as cement blocks and basic geometries were used for the making of the form that lack individualization and aesthetic appeal. The program for this middle school is standard; however, a majority of the space makes up circulation which has the potential to be reprogrammed. By reallocating programs and allowing programs to overlap, such as the circulation, the design decision to close off each stair to the main floor has lack of transparency and the potential to create areas that are susceptible for bullying. By opening one stair to the floor, this space could double as circulation and be used for instruction. Because bullying still remains an issue, the design decision to open one stair to the floor is a start. The project design becomes more cost efficient and responsive to the needs of the site, students, and faculty. The classrooms are also unequal. Many of them that lie on the main floor of the building lack windows, natural light, and connection to nature. The classrooms also lack flexibility and connectivity which can pose problems or the inability to assist the teacher with specific lessons. Many of these key words are basic needs that should be present in each classroom. Because bullying still remains an issue, the design decision to close off each stair to the main floor has lack of transparency and the potential to create areas that are susceptible for bullying. By opening one stair to the floor, this space could double as circulation and be used for instruction, similar to that of the Reed Springs Middle School precedent. Safety, encouragement of movement, and visibility help mitigate many of the issues that were so apparent in research and antiquated school designs.
The interior of the current school contains many areas that do not respond to recent research in educational facility design. The school has some dead end corridors that can be considered wasted space and also be confusing to children. All of the areas of vertical circulation are closed off which can be hotspots for bullying. Many of the classrooms are pushed towards the interior and do not allow for natural daylighting or ventilation.
The educational environment must provide opportunities for everyone to learn. Guided by a district’s mission and vision, it creates meaning and provides identity for learners as they work independently,” states Peter Lippman. Lippman also addresses Lev Vygotsky’s theory which explains that “learners can acquire knowledge more rapidly when working with others who are more expert in a given task.”

According to Schewebel, “tendencies were found which indicate that regular compulsory school - and curriculum based outdoor education programmes can advance students in the physical, psychological, and learning and social dimensions.” Outdoor classrooms carry many benefits and can improve mood of students and encourage and motivate them to collaborate and finish their work.

The current school does not include several programs that would be helpful tools for the teachers as well as the students. The BREAK OUT SPACES can act as extensions of the classrooms as well as transitional spaces for students to spend time reading or working. The OUTDOOR CLASSROOMS are great ways to encourage outdoor learning and provide connections to nature from the inside of the school. The MULTI-PURPOSE STAIR has the potential to do many things that would benefit learning, safety, and of course encourage students to move across the spaces.

Including a main stair into the design can accomplish a multitude of things while also providing a dynamic space for a variety of different programs. The open stair can provide for social space, encourage mobility or movement, and provide safety for students against bullying which occurs often in closed stair ways.

PROPOSED PROGRAM

PROPOSED ADDITIONAL PROGRAMS

1. BREAK OUT LEARNING SPACES
2. OUTDOOR CLASSROOMS
3. MULTI-PURPOSE STAIR

PROGRAM ADJACENCIES

immediately adjacent
importantly adjacent
reasonably convenient
unimportant
remote
These sketches outline key moments of the school that allow for multiple components to exist based on its location, adjacencies, and strategic design of one particular element. A main idea is considered, then layers of research are applied in order to have a more comprehensive strategy for the listed key moment.
These models were used primarily to experiment with these spaces sectionally. Lines of sight, natural daylighting, connectivity, visible nature, movement, scale, and air circulation were all important components to study within these spaces of interest.
These models totaled up the conclusions of the initial process section models. They extracted the experiences and components that were in question and pulled together to form these spaces.
During the schematic design phase, key moments have been selected based on their use or importance to the overall design concept. They will be the primary examples of how the research of well-being, learning environments, and safety can influence and act as the drivers of the design. The programs of focus include the entrance, break out spaces, outdoor classrooms, and main atrium space or circulation space.

**Programs of Focus**

1. **Break Out Learning Spaces**
   - What is the best design for students to collaborate? Can teachers use this transitional space to extend the classroom for different program uses?

2. **Outdoor Classrooms**
   - What can these outdoor spaces provide for students to enjoy these spaces? Can the topography dictate where these are located? How accessible should they be to the classrooms?

3. **Multi-Purpose Stair**
   - Can a stair case be used in multiple ways for different styles of teaching? Can it be open to the surrounding programs to increase visibility across the school?

4. **Entrance | Lobby**
   - How can the lobby and entrance be designed to be best respond to the safety needs of the school, the learning environment, and encourage movement across the site?

**Areas of Focus**
B E A K O U T S P A C E S
Break out spaces act as “third spaces” for students to reset their minds or to quickly gather their thoughts. They are designed to be used during or in between classes and have several layers of visibility that make them safe and useful for teachers.

R E S P O N S I V E E L E M E N T S

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<th>HALFWAY WALL</th>
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O R I E N T A T I O N
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

V O I D S
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

I N T E R N A L W I N D O W S
- Natural light
- Electrical control
- Window glass
- Visible nature
- Natural light
- Connection to nature
- Visible nature
- Temperature
- Territorial reinforcement

F I R S T B R O A D S C A N T
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

F O R M + E N V E L O P E
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

H A L L W A Y W I D T H
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

A D A P T A B L E P A R T I T I O N S
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

G L A Z I N G
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

B R E A K O U T S P A C E S
Break out space act as “third spaces” for students to reset their minds or to quickly gather their thoughts. They are designed to be used during or in between classes and have several layers of visibility that make them safe and useful for teachers.

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O R I E N T A T I O N
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

V O I D S
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

I N T E R N A L W I N D O W S
- Natural light
- Electrical control
- Window glass
- Visible nature
- Natural light
- Connection to nature
- Visible nature
- Temperature
- Territorial reinforcement

F I R S T B R O A D S C A N T
- Natural light
- Air quality
- Visibility
- Connectivity
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F O R M + E N V E L O P E
- Natural light
- Air quality
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H A L L W A Y W I D T H
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- Visibility
- Connectivity
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A D A P T A B L E P A R T I T I O N S
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale

G L A Z I N G
- Natural light
- Air quality
- Visibility
- Connectivity
- Scale
Outdoor Classrooms

Outdoor classrooms are a proposed additional program that can help in creating spaces that can assist in teaching or act as collaborative spaces for students in between classes or before/after school.
MAIN STAIRCASE
Originally, the main staircase for East Cobb Middle School was closed off and susceptible to bullying and lacked natural light. By opening up a main circulation space that can double or triple in program allows for the space to be utilized more often and populate it for safety.

THE PROCESS

RESPONSIVE ELEMENTS

OPEN ATRIUM
- air quality
- internal surveillance
- temperature
- scale

STAIRCASE
- adaptability
- movement
- connectivity

OPENINGS
- separation
- natural light

SEATING
- movement
- adaptability
- individualization

3.7 PROGRAMS OF FOCUS
The front lobby or entrance is a key factor in the safety and security of the school, but can also act as a quiet place for students to gather or wait to be picked up in the afternoons.

**LOBBY | ENTRANCE**

- Connectivity
- Flexibility
- Territorial reinforcement
- Movement
- Verticality

**STAIRCASES**

- Natural light
- Air quality
- Internal surveillance
- Ventilation

**GLAZING**

- Natural surveillance
- Natural daylight
- Visible nature

**GREEN SPACE**

- Connection to nature
- Temperature
- Visible nature

**OFF AXES ENTRY**

- Territorial reinforcement
- External surveillance
- Internal surveillance
- Controlled access

**THE PROCESS**

**RESPONSIVE ELEMENTS**

- Void:
  - Natural light
  - Air quality
  - Internal surveillance
  - Ventilation
- Scale
- Wayfinding

**Landscape**

- Controlled access
- Territorial reinforcement
- Connection to nature
- Visible nature
- Movement
THE DESIGN

How does all the research and schematic design come together to influence or drive the final design? Will it be responsive to all three areas of research?
The form of the project is primarily driven from the site, the program, and the necessity of natural daylight in the majority of the spaces. The form is created using steps which each are influenced by research and/or the needs of the project.

**FORM STRATEGIES**

1. **VOLUME**
   - By reducing a volume into strips, it allows light to reach more of the interior space. It also divides the site to accommodate for more programs such as outdoor classrooms.

2. **BEND**
   - Bending the bars creates “C” shaped space that directs views to the entrance and back of site. This allows for surveillance to reach further and again creates spaces outside.

3. **SLIDE**
   - Sliding the bars opens up sight lines and also exposes the outer parts of the bars to the entrance of the site.

4. **ROTATE**
   - The topography is advantageous to provide territorial reinforcement as well as carve outdoor classrooms. Rotating the bars takes advantage of the topography for the desired program.

5. **FILL VOID**
   - The middle of the bars is closed in to provide circulation space and common spaces for central programs like the library and vertical circulation space.

6. **SUBTRACT**
   - Carving into the common space creates outdoor space adjacent to the library and main circulation space.

**RESPONSIVE ELEMENTS**

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6. **SUBTRACT**
   - Carving into the common space creates outdoor space adjacent to the library and main circulation space.
The site strategy here is radically different than the original case study strategy. New programs, like the outdoor classrooms, also populate much of the space just outside the conditioned environment. Circulation spaces is designed to put the pedestrian (student) as the priority.

A. STUDENT ENTRANCE
B. VISITOR ENTRANCE
C. STAIRS AND RAMP TO ENTRANCE
D. PARKING LOT
E. PEDESTRIAN CIRCULATION PATH
F. RECREATIONAL GREEN SPACE
G. RETENTION POND
H. BUS LOOP
I. OUTDOOR AMPHITHEATER
J. RAIN GARDEN/OUTDOOR CLASS
K. PERIMETER FENCE
L. LOADING/BACK OF HOUSE
Circulation, private v. public, and visibility from the interior spaces remain critical concepts of the project. Circulation has been designed to encourage physical movement and safety for the student as they walk or approach the entrance of the school. The designed exterior is also designed for maximum visibility for safety as well as natural light, territorial reinforcement, and many other vital components.

The design of the school also pays close attention to what is considered private and public space to further the safety of the students throughout their school day as well as during extracurricular activities.
4.4 SYNTHESIS THROUGH SECTIONS

Sections have been a primary design tool for the overall thesis. These sections have been diagrammed and critically analyzed to understand how responsive each design is in regards to the three research areas: well-being, safety, and physical learning environments.

4.4 SYNTHESIS THROUGH SECTIONS

SECTION A | ENTRANCE

BREAK OUT SPACE
- visible nature
- natural light
- movement
- external surveillance

EXTERIOR STAIR
- connectivity
- natural light
- verticality
- visibility
- movement
- landscape
- view
- external surveillance
- controlled access
SECTION C | BREAK OUT SPACES

- Connectivity
- Adaptability
- Flexibility
- Separation
- Collaboration
- Individualization
- Verticality
- Movement
- Area of refuge

SECTION D | ATRIUM

- Clerestory
- Natural light
- Scale
- Air quality
- Temperature
- Display
- Individualization
- Collaboration
- Sociality
- Environment
- Access
- Area of refuge
SYNTHESIS THROUGH PLANS

Enlarged plans have also been vital representational drawings to carefully understand what is happening in terms of adjacencies, program placement, and connections to the exterior circulation areas.

LANDSCAPE
- Glass Facade
  - Controlled Access
  - Territorial Reinforcement
  - Connection to Nature
  - Visible Nature
  - Movement
  - Natural Light
  - Visible Nature
  - Connectivity
  - External Surveillance

OFF AXIS WALKWAY
- Movement
  - Territorial Reinforcement
  - Connection to Nature
  - Visible Nature
  - Movement
  - Natural Light
  - Visible Nature
  - Connectivity
  - External Surveillance

ENTRANCE
- Operable Partitions
  - Connectivity
  - Accessibility
  - Adaptability
  - Movement
  - Verticality
  - Connectivity
  - Adaptability
  - Flexibility
  - Natural Light
  - Natural Connection
  - Visible Nature
  - Movement
  - Air Quality
  - Temperature
  - External Surveillance

STAIRWELL NOOK
- Breakout Glazing
  - Scale
  - Individualization
  - Connectivity
  - Verticality
  - Movement
  - Collaboration
  - Internal Surveillance
  - Area of Refuge
  - Connectivity
  - Visible Nature
  - Natural Light
  - External Surveillance

ENLARGED BREAK OUT SPACE
- Main Atrium
  - Stairwell Extension
  - Connectivity
  - Accessibility
  - Adaptability
  - Movement
  - Collaboration
  - Internal Surveillance
  - Area of Refuge
  - Connectivity
  - Visible Nature
  - Natural Light
  - External Surveillance
**GREEN ROOF**

The green roof can accommodate for water retention on the site, acts as a water collection and decreases the amount of impermeable surfaces across the site.

**OPEN ATRIUM SPACE**

Open atrium space allows air to flow freely through and out the opening in the roof. It provides ample space for a multitude of programs and activities.

**GREEN ROOF**

The green roof can accommodate for water retention on the site, acts as a water collection and decreases the amount of impermeable surfaces across the site.

**BREAK OUT SPACE AREAS**

Break out spaces are scattered throughout the school for connectivity and to accommodate for activities where the standard classroom size is not enough.

**WINDOWS**

This break out space directly across the main atrium and stair opens up views to nature as a student travels vertically. Light also enters and travels through the floor plates.

**CLASSROOMS**

Classrooms are modular in size to establish a structural system that is easy to replicate and can be used for future programs.

---

**PROGRAM**

1. CLASSROOMS
2. BREAK OUT SPACES
3. SPECIAL EDUCATION
4. WORK ROOMS
5. TEAM PLANNING
6. COMPUTER LAB
7. SCIENCE CLASSROOMS
8. RESOURCE
9. AUDITORIUM
10. MULTI-USE ATRIUM
11. LIBRARY
12. ADMINISTRATION
13. VISITOR ENTRANCE
14. STUDENT ENTRANCE
15. CHORUS
16. ORCHESTRA
17. BAND
18. LOBBY
19. HEALTH CLASSROOMS
20. GYMNASIUM
21. CAFETERIA
22. KITCHEN
23. RECEIVING/BOH
24. ELECTIVE CLASSROOMS
25. LOCKER ROOMS
26. MAIN CIRCULATION CORE
27. OUTDOOR CLASS/SPACES
Main circulation stairs are on axis with the student entry.

Basement floor connects with the main floor through floor openings.

Breakout spaces add visibility to the exterior and create areas of refuge from the hallway.

Open floor plates above provide for more natural light and allow connectivity.

Hallways are widened to accommodate for programs that can extend out from the classrooms.

The library is centrally located and adjacent to the main staircase.

The cafeteria is a large commonly used assembly space so it’s placed on the bottom floor to encourage movement and protect students.

The cafeteria opens to outdoor space to accommodate for eating outside or for instruction/class use.

Areas of refuge are created through the intersection with space and the topography. These areas are used in times of natural disasters such as tornadoes.
The stairs are open and include glazing for safety reasons and to open up the main circulation space. This allows light to penetrate to the space underneath which allows alternative programs to take place underneath.

The space underneath the stairs as well as the main stair can both accommodate different programs that are necessary for the typical school day. Teachers are able to use these spaces as alternative break out spaces and lecture areas.

Having a variety of seating allows for students to move to where they feel most comfortable and productive.

Having the off axis entry space lengthens the amount of time it takes to get to the front entrance in order to encourage movement and for surveillance purposes.
Transparency adds another layer of connectivity and internal surveillance into these extra break out spaces.

Break out spaces allow for classrooms to extend out into the hallway spaces. This accommodates for more students to gather or to join classrooms for specific criteria.

The voids in the floor allow for light and visual connectivity to occur. Students can easily see what is going on the floor underneath which allows for more eyes which helps with safety.
Outdoor space gives teachers more room to move and acts as another extension of the classroom. The original design lacked outdoor spaces that were not easily accessible to the interior space.

Operable glazing allows for movement to and from the classroom into these transitional spaces. This allows for teachers to use outdoor spaces easier and help motivate students to be more active throughout the school day.

Glazing above allows for external surveillance and connection to nature. Light is able to penetrate through the entire classroom and helps keep watch of the outdoor space.
Displays allow for individuality and give the students a feeling of ownership in the classroom. Displays are also available in the hallways and break out spaces.

GREEN ROOF
The green roof helps with water management and gives level two classrooms direct connection to nature and green space.

GLAZING
The glazing allows for surveillance into the outdoor areas and gives natural light into the interior.

VARIETY IN SEATING
Variety of seating is essential for students to be productive and be able to feel comfortable in a classroom where they spend the majority of their time.
How responsive were each of these focus areas? Did each of them fulfill the needs of the three research areas? Overall, did the design respond to the theorem and in what ways?
By working in section, plan, and models, the design of the school displays the applied research in order to satisfy the set requirements. Safety, well-being, and the physical learning environment all work together to provide a space that best suits the students and the faculty that are charged with guiding the students. Overall, schools based on antiquated research and design strategies are no longer sufficient enough for students and faculty to fulfill their potential. This thesis project takes advantage and responds to all three of these areas of research: well-being, safety, and learning environment design. This proposed East Cobb Middle School acts as a holistic example of all of the research synthesized together for the result of a design that encourages learning, promotes well-being, and promises safety.

CONCLUSIONS

The designed site conditions are simple ways to address the three research areas. The form can simply provide visibility across the site as well as safe and friendly environments for circulation around the site.

The site plan highlights five primary ways of responding to the three research areas: perimeter fence, topography, landscape, entry, and outdoor classrooms. Some of these elements are heavier in one area in comparison to another; however, they all work together to create a successful space for students to receive what they need. The perimeter fence, although it does not respond to all three areas, is completely vital for the safety and protection of the back side of the school.

The designed site conditions are simple ways to address the three research areas. The form can simply provide visibility across the site as well as safe and friendly environments for circulation around the site.

The sections have been the most helpful in understanding the space in order to design while simultaneously acknowledging all the research that has been done. The strongest aspects are the main stair within the atrium, the floor openings, and the breakout spaces that populate different areas across the project. Internal windows, the clerestory, and display spaces are vital even though they do not respond to all of the three areas.

The enlarged plans also highlighted many strong elements. The enlarged plans also highlighted many strong elements. The off-axis walkway is also a strong element due to its strength in providing a safe way to access the school.

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A.2 FIGURES

A.2.1 "Cascading" Secondary School


A.2.2 "Cascading" Secondary School


1. Sandy Hook Exterior


1.8 Saunalahti Interior


1.7 Saunalahti Exterior


1.6 Reed Springs Interior


1.5 Reed Springs Exterior


1.4 Woodland Exterior


1.3 Woodland Interior


1.2 BIG "Cascading" Secondary School


1.1 BIG "Cascading" Secondary School


1.0 Grand Plan

This article discusses important characteristics in educational spaces which includes connection to nature, color, boundaries, break off spaces, lighting, context and orientation, connection of equipment, Design of Administrator’s Offices and meeting rooms, and roof access features.

1.0 Creating Safety


2. "The Exemplary Middle School"


3. "Clever Classrooms" Summary report of the HEAD Project


4. "The 10 Children’s Educational Spaces of 2014"


5. "Architects’ Pocket Rate in the Future of K-12 Learning"

Schools, starting from the Industrial Revolution, were modeled for discussion and passive learning techniques. They were branded as “cells & bells” and no longer work for our current education models. We need to reassess. We should spend more money on students and their environment that are healthy and engaging to learn in. Cattell, Sarah. "Architect’s Pocket Rate in the Future of K-12 Learning - EdSurge News." EdSurge, 11 July 2016, https://www.edsurge.com/news/2016-07-11-the-secret-to-architecture-s-pocket-rate-in-the-future-of-k-12-learning.
8. "Designing Collaborative Spaces for Schools"  
Understanding schools and the collaborative spaces within them.  

9. "Anatomy of School Bullying"  
Spatially speaking, Merrill breaks down the areas that are typical of bullying. Evidence shows that hot spots include areas that are not really visible. Forty-two percent of kids are bullied in hallways or stair cases.  

10. "Flexible Classrooms: Research Is Scant, But Promising"  
This article breaks down the findings by Peter Barrett regarding flexible spaces. Flexibility is outlined by “student choice within the space” and explains that the environment can improve the performance of writing, math, and reading by 14 percent. Forty-two percent of kids are bullied in hallways or stair cases. Flexibility proves to be just as important as all the other factors like air quality and temperature. Flexible classrooms can be good if used properly and can be more beneficial than static classroom designs.  

11. "The Architecture of Ideal Learning Environments"  
According to several top education design firms, five key principles of design were revealed regarding technology integration, safety and security, transparency, multipurpose space, and outdoor learning. Each principle is broken down to include case studies and some examples of what these principles look like.  

12. "School Building Assessment Methods"  
This is a fundamental way to assess a school building based on some key factors. They aim to pin point whether or not the environments help or harm the learning process. This has a lot of vocabulary that may be important in understanding how well the building functions and performs.  

13. "Effects of Regular Classes in Outdoor Education Settings: A Systematic Review on Students’ Learning, Social and Health Dimensions"  
This article discusses outdoor spaces and how they impact learning, social health, and well-being.  

14. "How Finland Keeps Kids Focused Through Free Play"  
An American teacher discusses some of the differences between her schools and the ones in Finland and how they use free play in between activities. The teacher learns that students become more attentive after fifteen minutes of activity in between learning. Students and teachers both benefit from the breaks, not become disadvantaged.  