

An
Educational
Interaction
Within
Nature

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A Design Thesis Submitted to the
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Landscape Architecture of North
Dakota State University

By

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Master of Architecture

Primary Thesis Advisor

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Enhance the Learning Environment

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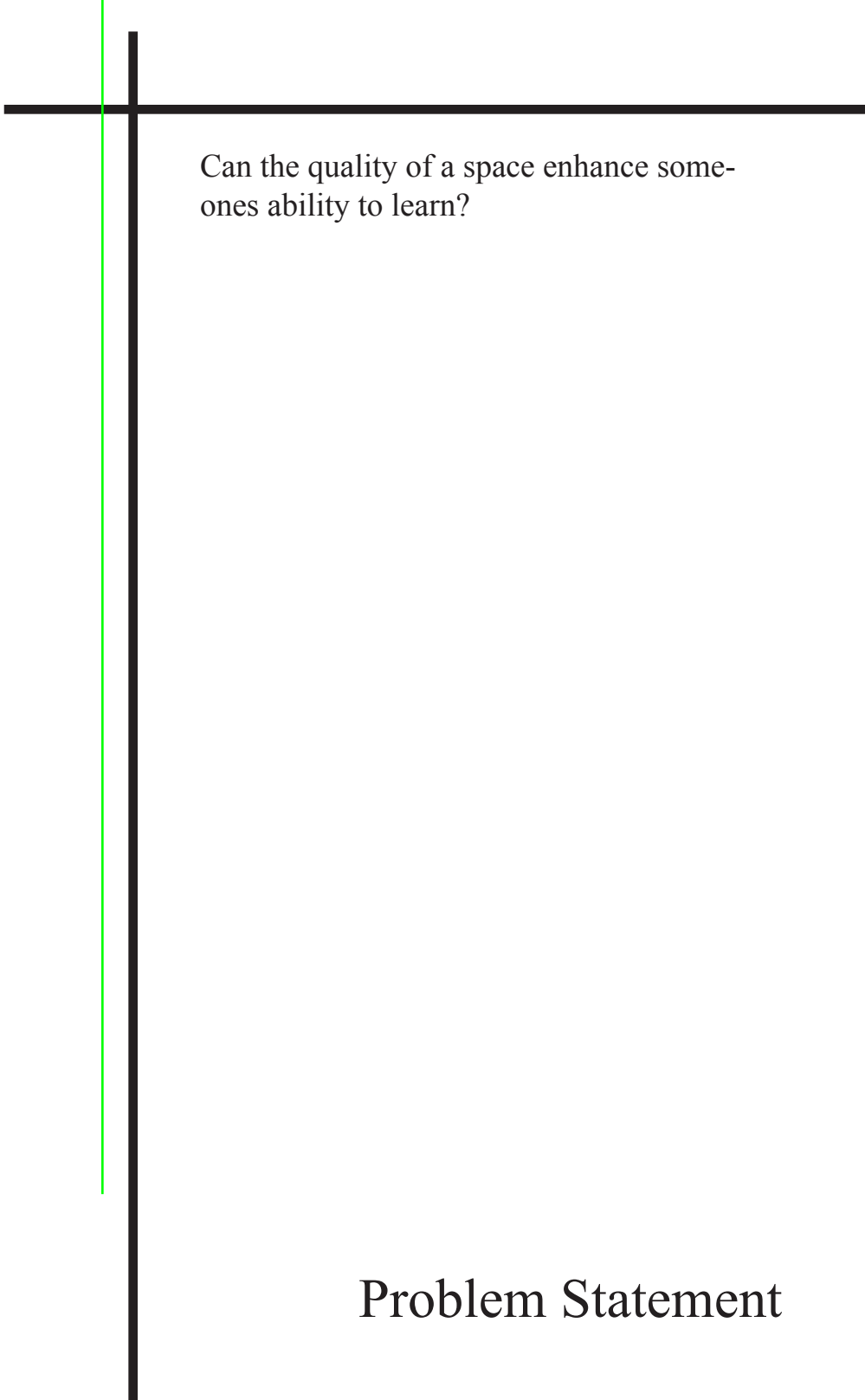
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Abstract

I have challenged myself to find if the quality of a space can enhance some ones ability to learn. The typology is a junior high school in the Midwest. This location will not only challenge me because of the various types of information that age group is learning but the multiple seasons will demand attention. I believe that we as designers can directly effect the inhabitants of our spaces .In the instance of a school, we can improve the ability learn. This is possible because the mind is directly related to the spaces we inhabit. In a student's situation there must be a balance in the space to focus the mind in on not the space itself, but the information being presented. Knowledge is the key to our past, present, and future as humans. We must continue to advance in the design for schools to keep pace with the expanding knowledge future generations are expected to retain.

Key Words: Ability to learn, school, mind directly related to space

Statement of Intent



Can the quality of a space enhance some-
ones ability to learn?

Problem Statement

Statement of Intent

Typology

The Typology for this thesis project is to design a middle school in the Northern part of the states. This specific location is to challenge the design to accommodate for the natural environment.

Claim

The ability to learn is influenced by one's state of mind. A space can directly affect the inhabitant's thoughts. Designers must be aware of the direct effect on the inhabitants of the spaces we design.

Actor: Designers

Action: awareness

Acted upon: Inhabitants

Premises

Designers must continue to develop and learn new ways of creating a proper atmosphere for the inhabitants of their spaces. Past projects should be studied but developed into proper spaces for modern times.

It is very important to understand how children learn and retain information. The key to research here is what types of surrounding elements increase the mental functions in kids.

The goal is to increase the ability to learn. Schools struggle with finding the proper balance of spaces that will create a good mindset for students but will keep the focus forward on the teachings.

Theoretical Premise/ Unifying Idea

The mind is influenced by the spaces we inhabit. It is crucial that we as designers find the optimum environment for the mind when information is being presented.

Justification

Knowledge is the key to the quality of life for society. We must continue to advance in the design for schools to keep pace with the ever expanding knowledge future generations are expected to retain.

The image features a minimalist design on a white background. A thick black crosshair is centered, with a vertical line extending from the top and bottom edges, and a horizontal line extending from the left and right edges. A thin, light green vertical line is positioned to the right of the black vertical line, starting from the top of the black vertical line and extending downwards, crossing the horizontal black line. The text "The Proposal" is written in a black, serif font, positioned to the right of the black vertical line and below the horizontal black line.

The Proposal

Sistine Chapel, Wrigley Field, Sears Tower; though very different spaces all have one thing in common, they all effect the inhabiter's state of mind. I have visited all three of these spaces and all evoke different emotions, most of which I cannot explain. The Sistine is an example of art, Wrigley is an example of character, and Sears Tower is an example of modern engineering. Each of these projects take control of my thoughts in one way or another. I felt smaller, reminding myself of the greater picture, standing on top of the Sears Tower looking out over miles and miles. Standing in the ballpark of Wrigley made me feel like I was part of history, I felt, even if only in that minute, I was part of a small community all passionate about the same thing. The Sistine Chapel makes you realize the capabilities of the human mind and hand and what great things people can do if they exercise their potential. All these spaces moved me and I learned different things in these projects.

If those projects influenced me in thought, our schools should do the same. Growing up in the Midwest the schools I attended were boxes with little connection to the natural environment. Children carried on with their day without ever seeing much natural light. In the winter months with activities after classes, students would enter the school as the sun was just coming up and leave as the sun had just gone down. The school has become a machine for learning and designed in such a way.

This thesis will study the way a mind is influenced by it's surroundings. Designers must create an environment that will influence learning, but also keep the student connected with the natural environment. There must be a balance in the spaces where a students focus is on the material being presented but yet the space influences that focus. The school should become not only a place for learning but a tool for that process.

Narrative

Middle school is a important step in the development of society's young children. This is the first step towards more independent learning and these years are when a child starts to make choices on his/her education. Grades 6-8 are crucial in the progress of kid's development in multiple aspects of life. The middle school is a very important step for children and the design of the school should be treated with careful thought. Studies of how knowledge is retained will become a crucial part in the design for these spaces and will influence the organization of the design.

The site chosen for the thesis is located in rural Montana in the small town of Red Lodge. This small community nestled in the mountains near Yellowstone National Park is home to some spectacular views and a wonderful natural environment. The climate contains all four seasons and will add to the challenge of the project. The natural environment with all the mountains will create opportunities to frame views and allow the inhabitants of the school to take advantage of the environment around them.

The goal is to develop a design which not only is aware of its context in the surrounding natural environment, but continue to focus the mind inward to the studies at hand. All aspects of the program must come together for a complete solution. The problem of educational design must be continually advanced to account for the evolution of societies, this will be one step along the way.

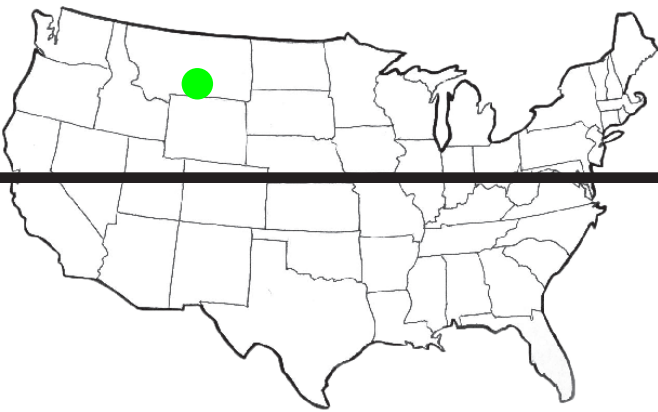
The school will be designed for the Red Lodge School District. The school district will run the facility, but the main users will be the children attending along with the faculty and staff. Also, with the school being located within a rural environment there will be more opportunities for various uses throughout the year.

The Red Lodge School District is made up of approximately 500 kids and around 200 of those children will be attending middle school. The school would be mainly used from August through May with limited use in the summer months. Being a middle school there won't be much need for parking spaces for the students but there will be need for spots for about 15 faculty and several other staff members totaling close to 30 spots. There will be ADA compliance for children with special needs and some special spaces to incorporate other needs for the community.

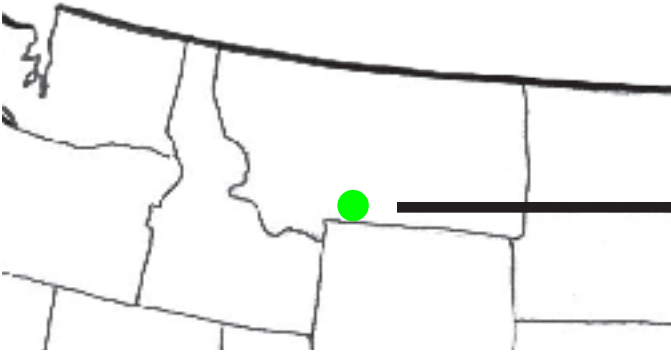
The community of Red Lodge is a mountain community with most of the inhabitants growing up around the area. The ski resorts bring in vacationers during the winter months, but residents will be people who grew up in area. It will be important to account for the community's needs as well as the children's needs to satisfy the client. With such a small community the design will need to incorporate cultural influences.

Project Elements

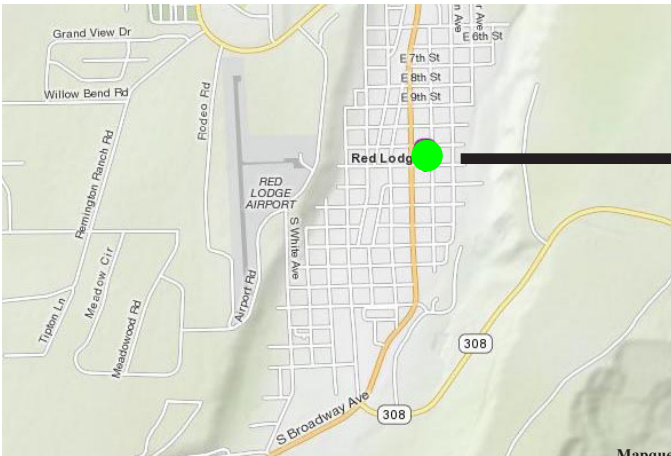
Entry Atrium :	Creates a instant impact on the person entering
Administration Offices :	Principal, secretary, staff who run the school
Faculty Offices :	Offices for the teachers
Custodial Spaces :	Offices and storage for the janitors
Classrooms:	Multi-purpose classroom spaces
Library :	Containing both books and media
Gymnasium :	Will house main sporting events
Physical Training :	Weight room, cardio, all equipment needed
Pool :	Full pool for students and community
Locker Rooms :	Locations where students change and clean up
Computer Labs :	Will house community computers for students
Science Labs :	Experimentation stations and equipment
Music Rooms :	Spaces for band, orchestra, and choir
Media Arts Lab :	For all types of media production
Art Studio :	For production of all physical art



Northern United States



Montana, Carbon County



Red Lodge, MT

Geographic Location

Site Information

Red Lodge, Montana

Geographically :	45 deg 11 min North, 109 deg 14 min W
Total Land Area :	2.6 sq mi
Elevation :	5,568 ft
Area Code :	406
Zip Code :	59068
Population:	2500 people aprox.
Density:	846 people per sq. mi.
Major Roads:	South of Interstate 94, Intersection of 212 & 78

Red Lodge is located just east of the Beartooth Mountain range, which is a section of the Rocky Mountains. This mountain range spans across some of Wyoming and Montana and contains higher peaks with surviving glaciers. Red Lodge is home to some of the most spectacular views of mountain peaks and a beautiful natural environment. The area is filled with peaks, lakes, waterfalls, and grass filled valleys. The location is known nationally for their ski resort in the winter months and their hiking trails in the summer months. This location contains many challenges with the environment, such as drastic climate differences in the seasons with snow and freezing temperatures in the winter and hot dry weeks in the summer. The site is a beautiful location but will also create a challenge for the design.

The most important study during this thesis will be on how the mind is affected by the spaces around us. What different features of lighting, sound, views, etc will influence the mind and what type of atmosphere is best for the learning environment.

Interests to be studied:

- How spaces effect our ability to learn.
- How a smaller community effects school design and how that school in return effects the community.
- How the natural environment effects design and materiality.

Project Emphasis

A Plan for Proceeding

Research Direction

Studies on the how the human mind learns and in what conditions will the mind flourish will become the backbone to my research. Branching from which comes studies on schools, the history of educational practice, the natural environment of Red Lodge Montana, and thesis requirements.

Design Methodology

I will take a mixed method quantitative/qualitative approach to my research with a transformative strategy. This describes an approach that will transform as my theoretical premise directs it so. This also depicts that measures will be taken to conduct both quantities of research and quality studies. This process will be documented both with text and graphics creating a full analysis of my research progress.

Documentation

The thesis process will be completely documented both with text and pictures in a well formatted document to be published and archived in the NDSU library. This document will be available to future scholars with interests in my topic and research. The thesis will be come together in the end with a presentation in front of my peers and instructors. This presentation will have multiple aspects graphically and verbally.

2nd Year Studio

2007-2008

Fall - Darryl Booker
Teahouse
Biohaus
Rowing Club
Spring - Stephen Wischer
Urban re-use
Unique Residential

3rd Year Studio

2008-2009

Fall - Steve Martens
Masonry Guild
Wildlife Research Facility
Spring - Ron Ramsey
Barn Revitalization
Chicago Hotel

4th Year Studio

2009-2010

Fall - Don Faulkner
High rise
Spring - Frank Kratky
Slum Redevelopment

5th Year Studio

2010-2011

Fall - Mark Barnhouse
Water Research Facility
Spring - Darryl Booker
Thesis

Previous Studio Experience



The Program Document



Theoretical Premise Research

There has been an ongoing conversation during the last 20 years of how a learning environment should be designed. Multiple things have pushed the design of schools to the point of where we are today including technology, culture, expanding knowledge base, and designers. I will go through and find what other professionals are saying towards this discussion and conduct research on the learning environment and develop an hypothesis of my own.

Bukky Akinsanmi is a LEED AP architect located in Dallas Texas. While she was with a firm named SHW Group she wrote articles on how the learning environment should be designed. The firm SHW Group is located throughout the United States and carries out projects throughout the world. They have pushed the envelope on school design and many architects who work for them develop their hypothesis on what a proper learning environment should be. Bukky wrote articles for Design Share which is a web site solely intended to be a tool for the discussion on school design. The website was constructed to be a base for professionals to bounce ideas off of one another and also to post case studies for the world to review and learn from. The website was very helpful in finding opinions on this topic and was a very good way to find out what other professionals within the career field are practicing every day with real school projects.

Bukky's article starts out by posing the question, "How can designers create the perfect learning environment?" Immediately I wanted to continue on and found this source to be exactly what I needed. She talks about how the answer to that question has been clouded because of so many different opinions on how humans learn. The educational environment has been shaped and molded based off of philosophers views on how children can take in information. The hard thing about the debate on learning environments is that most of the research has been carried out by philosophers and psychologists in the past and driven by how we learn and not how the physical environment around us effects that process. Bukky, being an architect attempts at finding a different viewpoint, one of a designer, in how schools should be built. She structures her article on three different learning types and the environmental response to each particular learning type.

Behaviorism is a belief that the human mind

Bukky Akinsanmi

Bukky Akinsanmi

is a blank slate when we are born and that we learn based off of positive and negative reinforcement for our own behaviors. These behaviorists, or researchers on the behaviorism theory, believe that learning is carried out through exploration until a desired response occurs. This school of thought puts a lot of the responsibilities solely on the teacher for they need to create the correct responses to keep the student involved and learning. The thought is that if a teacher can keep the student interested and excited about the topics that the child will try hard to get the answers they are looking for. Research of this type of learning has been carried out on animals with some success and finding that with the right motivation, animals will try to find the right action to get what they want.

Behaviorism doesn't put much pressure on the environment therefore in older schools that were based off of this principal were more like assembly warehouses than learning environments. Bukky refers to these schools as being like Henry Ford's assembly lines, new learners or raw materials in the classroom at the beginning of the building and graduates or finished products at the other end of the building and one must work their way through to find success. These old schools contained classrooms focused on the teachers which makes sense because of their importance on this particular process of learning. I believe everyone has been in one of these classrooms where there are just columns and rows of desks with them all faced forward toward the teacher and a blackboard. These buildings had minimal connection with the environment due to the importance of focus forward. The schools didn't want any motivation toward's other things to enter the child's mind.

Cognitivism came after behaviorism when philosophers found that it didn't pertain to all children and other ways of learning. The idea behind learning needed to evolve. Cognitivists believed that you can't just exclude mental processes by limiting learning to behaviors towards a goal. Bukky found a way to explain this way of thinking in that "the mind is like a black box - one that needs to be opened and explored. The black box, like a computer, receives information, processes it and then produces an output that may be stored in the mind or exhibited in behavior." (Akinsanmi, 2008). This type of learning puts the responsibilities to the student and that the student's actions are a result of thought and the learning process is carried out in the mind and the

mind has a particular plan. When changes in that plan happen, the mind thinks about the changes and learns from those changes.

Schools that were built in the second half of the twenty first century were based of the cognitivism approach to learning. These buildings contrasted the previous behaviorism viewpoint in that the classrooms were laid out to influence curiosity and help the students explore and experiment. These buildings broke up the assembly line of old design and the schools became similar to what modern campuses are. The classrooms were split into groupings with space between them and walkways that reconnected the student to the environment. This is the first connection to the environment that were found in schools and this connection was thought to increased explorative passions and ambitions. The inside of the classrooms were still relatively the same with the students found in rows and columns faced towards the front but the biggest jump was the broken up day where while moving from classroom to classroom the student received moments of being connected with the environment and other students.

Constructivism is one of the more modern ideas on learning and is closer to what learning is thought of today. Constructivism disagrees with behaviorism in that the mind isn't a blank slate when we are born. Constructivists believe that the student constructs knowledge through experience up to the level of that learner's development. Bukky puts it as "learners interpret new information through their contextual experiences and build on their existing knowledge from the conclusions reached during the assimilation of and reflection on new knowledge." (Akinsanmi, 2008) The article also talks about that this type of learning emphasizes the individual. This type of learning puts importance within social interaction, experimentation, exploration, and then reflection after the whole process. This reflection is key to the learning and locking in the newly acquired information.

The schools that have started to be built based off of the constructivism theory are centered more on the student. The article describes the buildings as focused on the collaboration, cooperation, and experimentation. The teachers now become facilitators and less the leader in the learning process. The schools and classrooms become more comfortable places where interaction with other students and the environment are encouraged. The

Bukky Akinsanmi

rooms contain more natural light and views outside, and the building begins to contain outdoor learning areas as well as indoor commons for students to socially interact. This idea of schools becomes a benchmark for more of the modern designs and many of the new learning theories are branched off of the constructivism theory such as the brain-based learning theory. This theory has ran such tests on the functions of the brain and concluded that people actually learn better in a enriched environment full of exploration and though experimentation.

The article moves on by concluding that most of the learning theorists don't define the physical spaces that are connected to the particular learning theory, so much of the schools are designed based off of number of students and spacial requirements. Also, old schools become adapted to new ideas and technologies due to high costs of building a completely new school. Bukky discusses the importance of understanding the viewpoint of the particular school district and school board that you are designing for and their opinions on the learning theories. The measure of success in a school design is whether the architect has the ability to interpret a particular learning theory spatially and that the design approach must create "places of learning and not just spaces for learning." (Akinsanmi, 2008).

Dr. Leslie Owen Wilson is a professor at the University of Wisconsin Stevens Point teaching a 790 level class called Brain Based Education. Leslie wrote online articles posted for the use of students when learning about the brain-based theory of education. Brain-based learning is stated to emphasize how the brain naturally learns and unlike older theories of learning this modern idea is backed up by neural research. This neural research allows us to know a lot about the structure of the human brain and learn some of the functions at different developmental stages.

The article starts off by going through the history of brain-based learning theory. The older learning theories saw the brain as parts and what particular parts someone uses. For example the idea of left brain versus right brain. This newer brain-based learning theory speaks of the brain as the whole is greater than the sum of its parts and the learner needs to be stimulated throughout the whole brain. In the modern era, neuroscientists have done research using autopsies, experiments, many different scans and these studies have been constructed using double blind, diverse, multi-age, multicultural groups of people to gather information. Through this extensive research process extremely valuable information has been gathered on how the human brain actually

Dr. Leslie Owen Wilson

retains information and how the human brain processes this information to learn from it. (Some of the core principals based of this research can be found in appendix A in the back of this thesis program.) The main idea behind most of these core principles is that the brain is a complex processor that can take in information from everything, whether it be the space some one is experiencing to re-evaluating old information based off of new experiences. These principals also discuss that learning engages the whole body so to enhance ones learning ability you must allow this person to stretch out and utilize every sensory organ to take in information. Another one is that humans search for meaning is innate and if you can harness this and create curiosity for the student that the human instinct will take over and the student will want to find the answer for him/herself. These core principles direct and influence the brain-based theory of learning. The article goes on to talk about teaching elements that come from these core principles.

The first of these practices is orchestrated immersion. This means that the instructor must create a learning environment that immerses the students in the information. This can also drive the design of a classroom for example if the class is on earth sciences the students must be able to interact with the earth. This idea of immersion is to take advantage of the brains abilities to comprehend spaces and the goal is to help students understand the meaning behind ideas not just memorize that idea.

The next practice is called relaxed alertness which means that the environment must eliminate fear but also challenge the mind. There are many ways to create a calm environment and this can be accomplished by the instructor or the designer of the school. With new schools, this should be taken into account for the design of the classrooms which will decrease the hardships on the instructors allowing them more attention to the lesson plans and the students. The whole idea is rounding back to how the school becomes a tool for the learning. This calming environment allows for the children to stretch out their mind allowing for maximum potential for learning.

The third practice that is suggested is called active processing, which is where new information is connected to old information causing the student to actively and continually process the information and add to their knowledge database. This continual

Dr. Leslie Owen Wilson

Dr. Leslie Owen Wilson

process is extremely important between years of school to decrease the lost time during the summers.

The brain based research also allows twelve design principles for the learning environment to be developed. (Please see appendix B for the full list of design principles.) A few of the design principles discuss the idea of flexibility with in the environment whether it be allowing the students to interact with the outside and the inside without disruption to allowing the walls to become galleries of work and information that can change throughout the entire experience. The design ideas also talk of creating environments with many different types of spaces within the learning classroom. Children like to explore and interact with the spaces differently. Nooks and crannies create the curiosity to explore and interact with the classroom more. Areas of the school should utilize different colors, sounds, light conditions, materials, and views. All these different spaces keep the mind engaged with it's surroundings and keep the student mentally focused on thought. An important thing to always remember is that students need some sort of quiet reflection in order to properly process new information. They also require a sense of personal space to influence and express their individuality, whether it be a locker or a desk. These design principles should be considered when thinking of a new school and are great starting points going into next semester's design process.

The article goes on to speak of emotion and how attention follows emotion. Two different ways to of harnessing that emotion is music and art. Both of these things can bring about some sort of emotions in nearly every child. Music can carry messages for learning while calming down the student or energizing them which ever is needed at that time. Art is a great form of expression and can create emotional connections and releases. Art can also help trigger the memory of information being presented for example if a power point project is aesthetically pleasing the student might connect the graphics with the information and have a easier time remembering it.

Dr. Wilson also says that it is important to use many different and diverse forms of assessment. These different forms of assessment allow for students to reflect on achievements and can influence pride and a feeling of accomplishment. Portfolios are a good way to look back on what has been accomplished and what has been learned.

In 2008 Randall Fielding teamed up with fellow architect named Annalise Gehling and published a paper on the learning environment labeled, Lessons from the Mall: A school with a Commercial Aesthetic Makes Young Minds More Receptive. The articles opening statement was “Turn your school into a marketplace of ideas” (Fielding, 2008). The article discusses how the modern day mall has replaced the old town squares as central hang outs for the youth of America. It is very apparent that one would see more youth actually engaged with their surroundings at the mall rather than at the school. Reasons for this could be that children feel much more at ease shopping and hanging out with friends then trying to study or carrying out an experiment. I also think this notion could differ between age groups and this idea of the mall would be more towards kids when they get older into the middle school range.

Fielding continues by trying to understand the design of the mall. The main focus of the design is to entice and captivate, he says. This welcoming in and inviting the person to hang around entices many people to spend even an afternoon being enveloped into the bright colors and warm lights. The idea of a building influencing someone to come in and stay for a while has not been transferred into school design. Most schools out there today are buildings where the youth want to retreat as soon as possible. He discusses that schools should provide young people spaces to come and socialize, explore, and exercise some independence because at school is where the youth learn about themselves and exercise their minds without the influence of their parents.

Fielding then goes into what he calls merchandising 101. This breaks down the different aspects of a mall design and tries to understand the fundamentals in order to carry them over to school design. The mall is fundamentally inviting with spaces for socializing and gathering and we must bring some of these spaces into school design to respect the growth and the social need of children. It is a fundamental need for humans to learn culture and how to interact with others. This sounds like education that children are trying to learn in preschool and kindergarten when the kids are just starting to learn the basics of growing up. Some other concepts that should be broken down is merchandising. Malls utilize this technique to showcase product and influence wants and desires. Schools must use this for showcasing products that the students are proud

Randall Fielding, AIA

Randall Fielding, AIA

of. By showcasing work throughout the school spaces it not only allows students to feel pride and a sense of personal accomplishment but also allows other students to gain interest into the subjects being learned by others. The article follows the idea of invitation a little farther with inviting students to become influential. By allowing students to present their work and knowledge to other students, the children learn not only the topic they are studying but leadership skills and public speaking skills. These presentations allow for kids to become more comfortable and confident about themselves and their abilities and knowledge.

Going more into the physical differences between a mall and older schools the article talks about how malls contain openness, many different sources of light, flow and flexibility, and choice. The history of these elements date back to plazas in Rome where people loved to interact with not only the people that would gather, but there surroundings as well. Another difference between malls and school is the store fronts are changed very often to reflect the particular time period or style and schools are usually left for many years with the same colors and materials. This allows flexibility and change to attract new people and keep the people coming back to new and attractive experiences every time.

The article goes into suggestions on how to create this welcoming and intriguing atmosphere in a school. There are ways of incorporating some aspects of this idea without new construction and renovation. The article talks about getting the students more involved in the curriculum and by doing this they become more invested in their education and feel more in control of their personal experience. Sometimes small remodeling projects can go a long way as well with comfortable gathering locations being created throughout the school or display areas for the students showcase their knowledge and to find pride in their own work.

In the end, the article explains that schools should be a place for learning and not shopping and hanging out, but if you break the differences down into the fundamentals there are some aspects of design that can carry over and possibly make the students become more receptive towards their education. The school should not become a mall for learning, but design schools to more desirable to the youth would enhance the children's experience in the school system.

The mind is influenced by the spaces we inhabit. It is crucial that we as designers find the optimum environment for the mind when information is being presented. This is my theoretical premise unifying idea which was stated earlier on in this thesis project. With further discussion, it was decided that I needed to dive into the theories of education and learn what studies have been done on how our minds work and how the environment around us can influence our minds. That information and answers to those questions would help me continue with looking into the site and starting to think about a school design.

The research led me to published articles by other professionals within the architecture career. The first was a architect named Bukky Akinsonmi, an architect out of Dallas Texas. She had been studying the different types of educational theories and brief histories on each. She also tied them together with design and aspects of the spaces that would be driven by these educational theories. This article got me on the right track by showing me how educational theory has developed into an idea that the mind is so complex that it learns with everything around it. The latest educational theory that has been further developed until today is the brain-based theory.

I was lucky enough to find Dr. Leslie Owen Wilson, a professor at the University of Wisconsin Stephens Point. She teaches a class on the brain-based theory of education and reading through her notes I was able to learn an extensive amount on this particular educational theory. Being more of a modern theory there are actual research experiments done on the human brain to back up the hypothesis with in this theory. The brain-based theory states that the brain is effected by everything around it. The child can take in so much more information at a time than once believed and so we need to surround the child with a welcoming and interesting environment. The younger children need many different types of spaces within classrooms in order to influence their curiosity to explore. The children need to have safe spaces for them to feel comfortable in order for the bodies and minds to stretch out. The brain-based theory also stated that a mind at ease can retain much more knowledge much a like a runner who has already stretched and is comfortable can run faster than a nervous and tense runner. These studies prove my idea of the mind being influenced by it's

Research Summary

Research Summary

surroundings and send me forward towards my eventual design. This brain-based theory will be a benchmark for my school design and seems to be the theory that all others will branch off of in the future. Schools are becoming more user friendly and slowly but surely schools will become more of a tool for learning and not just a location where everyone meets.

I also wanted to look into other ideas on where school design is headed into the future and found a very interesting article published by a man named Randall Fielding, a member of the AIA and a practicing architect along with Annalise Gehling, a practicing architect. Their article speaks of trying to create a more of a welcoming space for children and youth to gather for a school. Their bold ideas are based off of a shopping mall theory and how the youth hang out at shopping mall so there must be qualities within malls that interest and welcome youth to hang out there. The article talks about the warm colors and lots of light in the malls. Along with those attributes are open spaces and flexible spaces. The malls have some areas in them where the connection to the outside environment is great and some areas where you can feel isolated and away from it all. The mall has a lot to offer the youth as far as social spots and hang out spots. In the end the article does give in to the fact that schools shouldn't not just become malls, but if we break down the attributes of a mall and what is appealing to the youth, we may learn some basics design ideas that could be implemented into our school designs.

Overall, I learned a lot about the educational theories that drive our school systems and more about how we as designers should look at the youth and culture of today and of the future. Throughout the research some of the ideas were more relevant than others and the brain-based educational theory will become a major keystone in my theory behind my design. This research in the theory of education teamed with the case study research and the history of my small rural community will become a great stepping point going into the design phase. I was once told that to become a designer for a particular profession, you must become an expert in that profession. I don't and won't believe I'm a expert, but I'm much closer than before and I'm working my way there. At least now I know for sure that the spaces around us do influence our ability to learn and I will continue forward into my design.

(Curtis, 2003)



Great Notley Primary School

Blickling Road, Great Notley

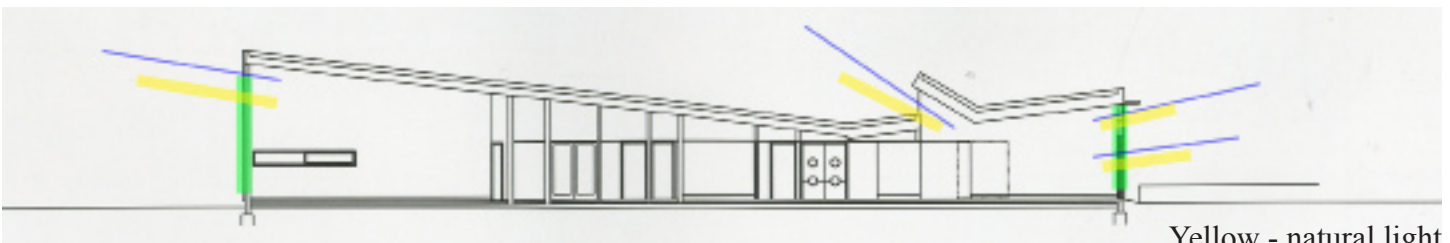
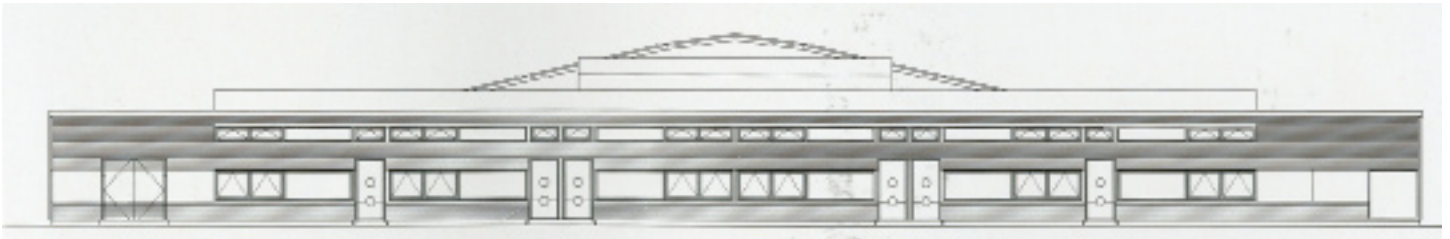
Essex, England, CM77 7ZJ

Designed by Allford Hall Monaghan Morris (AHMM)

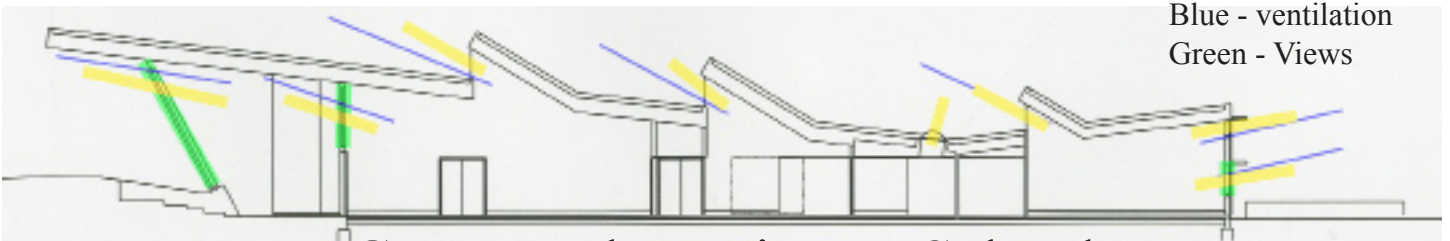
Finished Construction in 1999

60 students per year

7 different age groups organized 3 phases



Yellow - natural light
Blue - ventilation
Green - Views



Great Notley Primary School

The Great Notley Primary School is located over in Essex, England. This school was one of the earlier attempts at sustainable and green practices in school design. There was a design competition for the rights to build this school and Allford Hall and Monaghan Morris won the bid. They had previous experience in school design and also had knowledge of green architecture. The school was not only supposed to be a benchmark for all other schools to follow in sustainability, but it was used as a tool for learning about school design. All of the construction and designing methods were recorded and preserved to the architecture community could review all the processes.

The design team was formed with architects, consultants, and artists from all over and the team discussed many different over all shapes to guide the structure. A triangle was decided to be the best idea to move forward on. The triangle design was found to have the highest floor to wall ratio and allowed

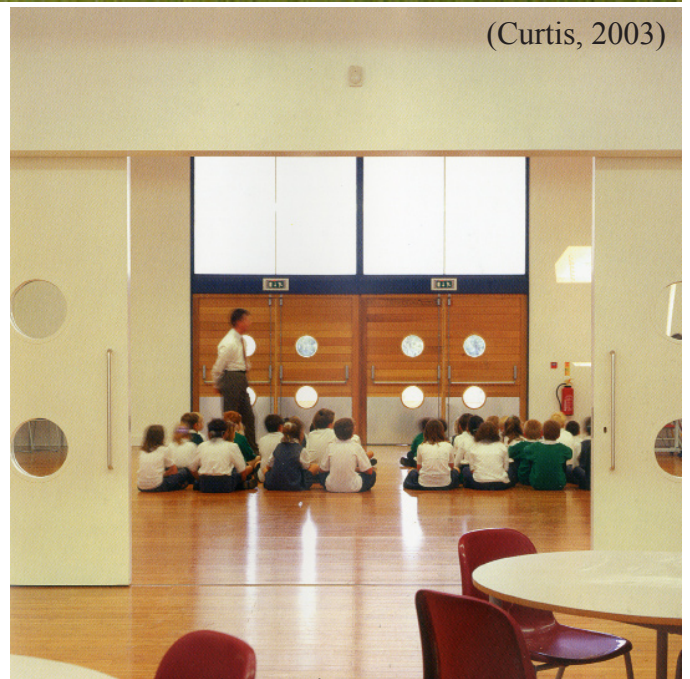
the designers to be extremely flexible with the interior walls and rooms. The design team located all the classrooms on the exterior walls with the circulation and the larger spaces towards the center of the plan. These larger spaces including the cafeteria and gymnasium still gain natural light through the sky lights with the roof being built with shifted planes to create openings for light and circulation. At the nose of the triangle, an outdoor covered teaching area is formed for easy flow from the interior meeting spaces. This area allows for teachers to bring the learning environment inside and outside flawlessly to keep the kids interested and excited in the lessons. The exterior walls of the project are filled with windows for natural light and ventilation as well as allowing views out into the natural environment. The spaces also have the main entrance and exits towards the exterior of the building forcing the children to interact with the natural environment between activities and throughout the day.

(Curtis, 2003)



Many interior spaces have slides walls as pictured to the right showing extreme flexibility between open spaces. The project exercised many sustainable practices as well with selecting materials that had high recyclable factors and low impact materials as well. The openings not only on the exterior facade, but also within the roof structure allowed for maximum circulation and light without relying on artificial air and energy using lights. The project was considered a success at the time and was given awards for its progress in the school design field. My favorite part of the design is the outdoor learning environment at the nose of the building. This space allows for the imagination of the teacher and of the students to build what ever learning environment that is necessary for each lesson and day.

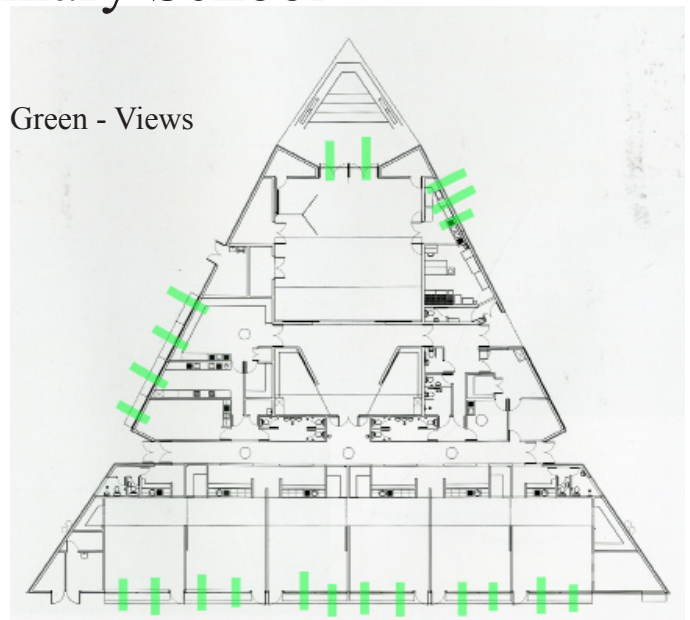
(Curtis, 2003)



Great Notley Primary School



Green - Views

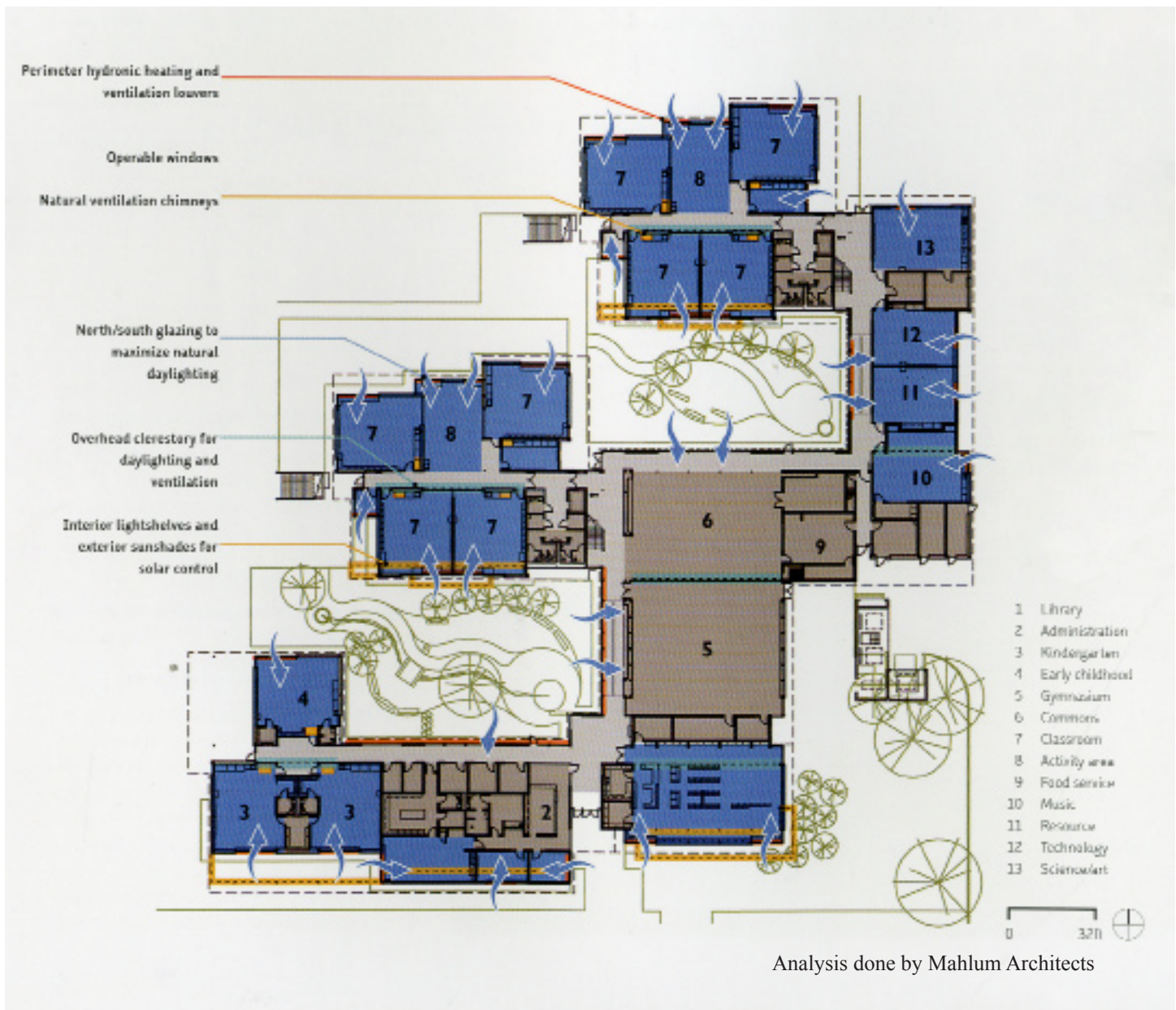


(Mahlum Architects)



Benjamin Franklin Elementary School

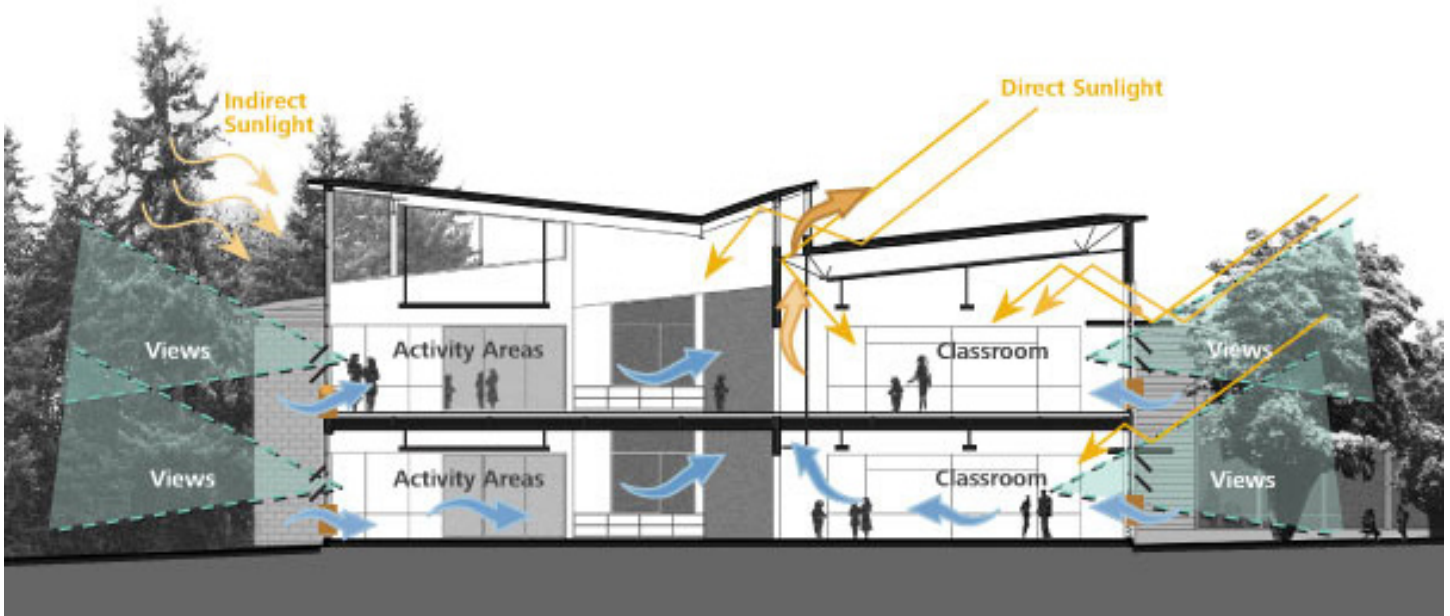
12434 N.E. 60th St.
Kirkland, WA 98033
Mahlum Architects
Finished Construction in 2006
450 students
Grades Kindergarten through sixth grade



Benjamin Franklin Elementary School

Located in Kirkland Washington, this school was a study done by Mahlum Architects based on sustainable goals for a learning environment. The opening statement about the school's design is that "learning is about creating connections. That's one reason why the new school was designed to connect students directly with the environment in which they live" (Ford, 2007). This school is place just on the outskirts of a naturally wooded forest and the design team took care in placement and orientation. The firm took and pulled nature into the building with trees and gardens inside the courtyards shown in the above plan. These courtyards allow for every classroom that is in the building to have some connection and view into the environment. That connection is strong and allows to feel comfortable with in the classrooms.

The courtyards also act as natural learning environments where students can hang out and study and focus while being surrounded by nature. These courtyards also act as a tool for learning because of the intricate detail taken to show water collection and ventilation studies along with sun and shadow studies. These courtyards allow the child to learn about the environment around them and learn about the different elements and how we as humans interact with them. This school teaches kids from preschool all the way up to sixth grade. These kids are spread out in clusters, or groupings of classrooms, where all of the rooms have an exterior wall to allow for natural ventilation, direct sunlight, and views out to strengthen that connection with nature. This building form allows for less dependence on mechanical and



Analysis done by Mahlum Architects

Benjamin Franklin Elementary School

artificial lights and lessens the eco-footprint of the building. This school was an attempt to create a model for future school design within the state and hopes for a future where these practices are required by law. Some other sustainable practices carried out by this design include; operable windows with automated controls that keep air quality at a certain level, low-flow plumbing including waterless urinals, rain gardens that collect storm water and filter it to reuse throughout the site, efficient building materials and all found locally, ventilation chimneys to create a stack effect within the classrooms, and many others that create a highly sustainable design.

The graphical analysis done by the Mahlum Architecture firm located on both of these pages shows the amount of thought that went into locations of classrooms and orientation of all the spaces. The floor plan on the opposite page shows location of the natural ventilation in each room and the ventilation chimneys as well. I particularly like the courtyards and the job that they do in creating a comfortable natural space for learning. They also work as a tool for learning the environment. This type of design is very successful and should be taken into consideration.

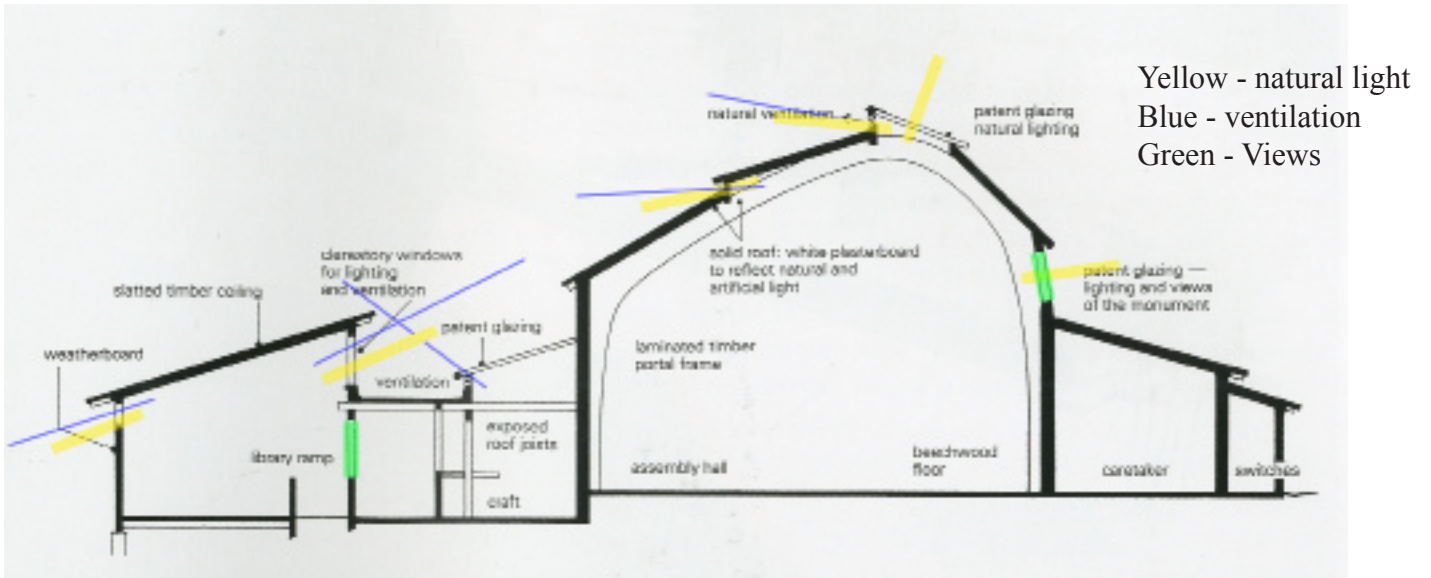




(RJ Watkinson)

Woodlea Primary School

Atholl Road, Whitehill, Bordon
Hampshire, England, GU35 9QX
Hampshire County Council Architects
Finished Construction in 1991
203 students
Pre-Kindergarten through sixth grade



Woodlea Primary School

The Woodlea Primary School is located in Hampshire England. This project is unique to all others due to the site and layout of the buildings. The school is set into a secluded heavily wooded area. The trees rise up and engulf the building and all the views around the building. The design is well placed within the forest and also within the hills of the site in order to minimize the effect on the natural environment. Great care was taken to build the school around the trees and the rolling hills and the school was set into a natural bowl on the western part of the site. The single level plan spreads the classrooms apart with timber decking connecting them. These decks create outdoor spaces for the children to play and relax. These spaces force the children to connect with the natural surroundings between activities throughout the day. The Project utilizes the local materials from the cite with a timber post and beam structure. The floors are clad in terra-cotta tiles designed by the children and placed by a local artist. The other floors are basic timber structure with hard wood floors and carpet in the classrooms to soften the floor. The design shifts the roof planes to allow massive amounts of light into the rooms with the use of sky lights. This is shown to the right in the image of a classroom. The school also uses insulated floors, walls, and ceilings to create little to no energy loss. This lowers the heating energy needed in the winter months and



(RJ Watkinson)



Woodlea Primary School

operable windows create cool ventilation during the summer months. The orientation on the site also allows for shading in the summer when the direct light is not wanted but allows direct light in during the winter months.

The whole idea behind the school was to create an entire learning environment incorporating the natural environment with the built environment. This school was very early on in the discussion of what a learning environment should be. This building being finished in the early 1990's has been an example set for every other design since. This was an early attempt at "learning through the landscape" (Curtis, 2003).

Taking a look at the plans and sections, the abundance of windows in the classrooms allows for a lot of views out and thins the line between the classroom and the natural environment. The plan is also spread out on one level, which I believe is called the campus effect. This campus effect is a

successful tool to get children active throughout the day and keeping the connection to the natural environment. I especially like the decking system placed throughout the design. These decks act as circulation but also as spaces for learning and interacting with the landscape. Looking at the section, you can see the utilization of shifted roof planes in order to create open pockets for light and ventilation. The designer can use these roof planes to direct light in to spaces where the warm of the sun is enjoyed but also shade the spaces where technology is used and direct light produces glare.

This project was a very successful design in its time and you can see where the base ideas have been taken farther in more recent projects. This project is unique because of the site and the extensive use of the timber construction but that timber adds another connection to the natural surroundings. This school has become a tool for learning and has been a successful design.

(Patkau Architects)



Strawberry Vale Elementary School

4130 Rosedale Avenue
Saanich, BC, Canada, V8Z 6B1
Patkau Architects
Finished Construction in 1994
290 students
Kindergarten through fifth grade



(Patkau Architects)

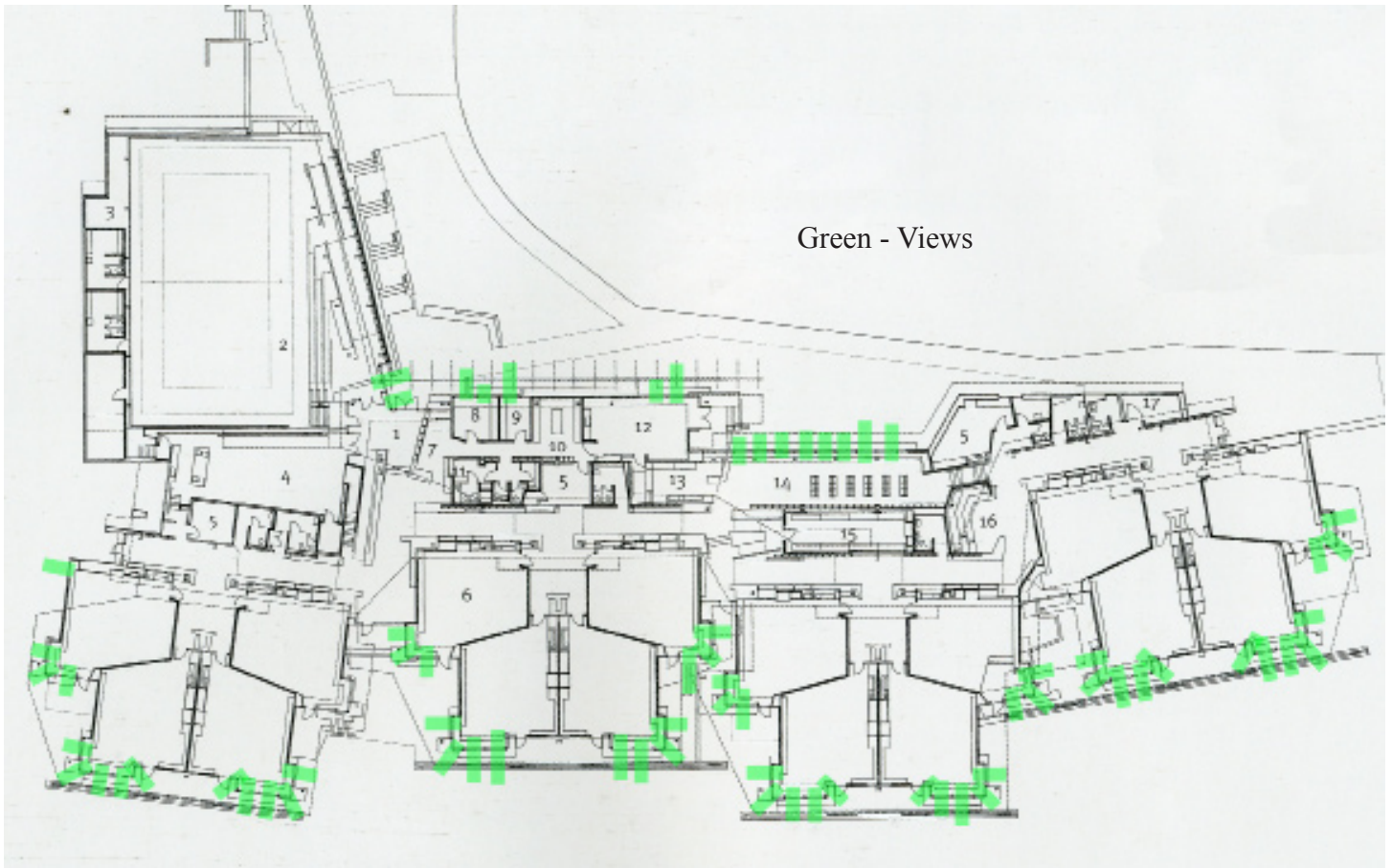
Strawberry Vale Elementary School

Strawberry Vale Elementary school is located in British Columbia Canada. This particular school is designed by a firm named Patkau Architects. This school is a shining example of what can be accomplished when bringing together thoughts of what a learning environment should become.

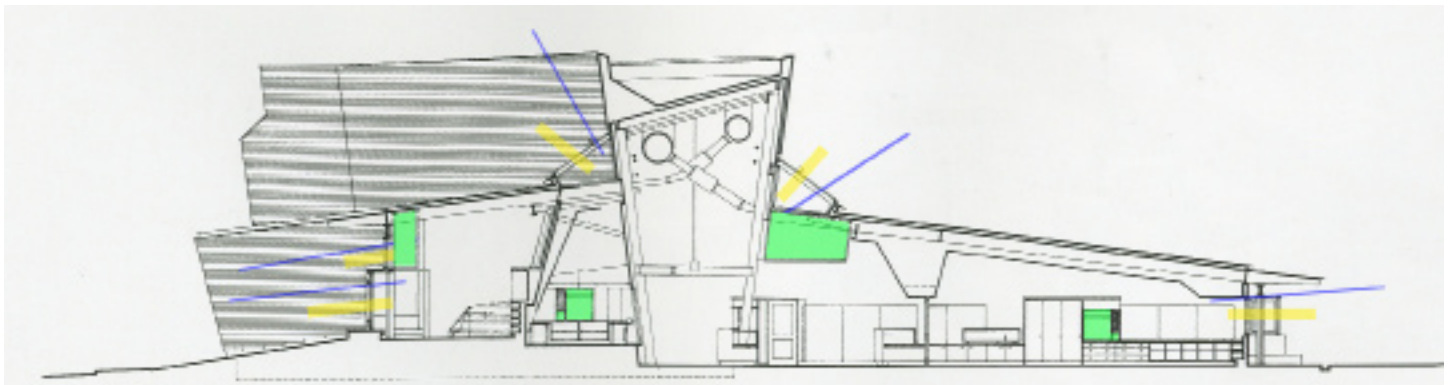
The site is a sloped site from one end to the other and contained a old school. The old school was dismantled and placed on a other site to re-use as a preschool center. The site has beautiful natural features with many trees and rolling grass hills. The site also contains natural rock piles that break up the greens of the grass with the warm tans of stone. The school site is placed among a suburban area built around natural wetlands and large oak groves. With a site like this, the designers wanted to be careful in the planning of the layout and felt it the utmost importance to create a learning environment that captured the natural environment as well.

The layout was decided to create classroom clusters along the south side of the building to allow natural direct light into those spaces creating a warm learning environment for the children. By creating clusters of rooms joined together by a long meandering hallway, all the rooms end up with walls with windows for natural ventilation and light.

The plan as you can see on the right, shows this grouping of rooms with a hall that cuts through the middle of the building. There is also a park located to the south of the school building and the windows that allow light and ventilation also connect the students to nature and to the views of the park. Because of the sloping sight, care was taken to step the building ever so slightly in order to allow for all the classrooms to be at grade and the rest of the building to step down along the slope. The designers felt it was necessary that if you give the children views and a connection to nature that you must then allow a direct entrance for the children to move back and forth between the classroom and the natural environment. Doors to the outside allow the instructors to utilize exterior space within nature to teach class on good weather days. The exterior space can be used for exploration, play, and quiet reflection time. This building fully exercises the idea of the learning environment requiring connections to nature in order to keep the child's mind stretched out and comfortable to maximize learning potential. These clusters of four classrooms is a very successful design technique and should be considered when ever a designer is attempting to create a proper learning environment.



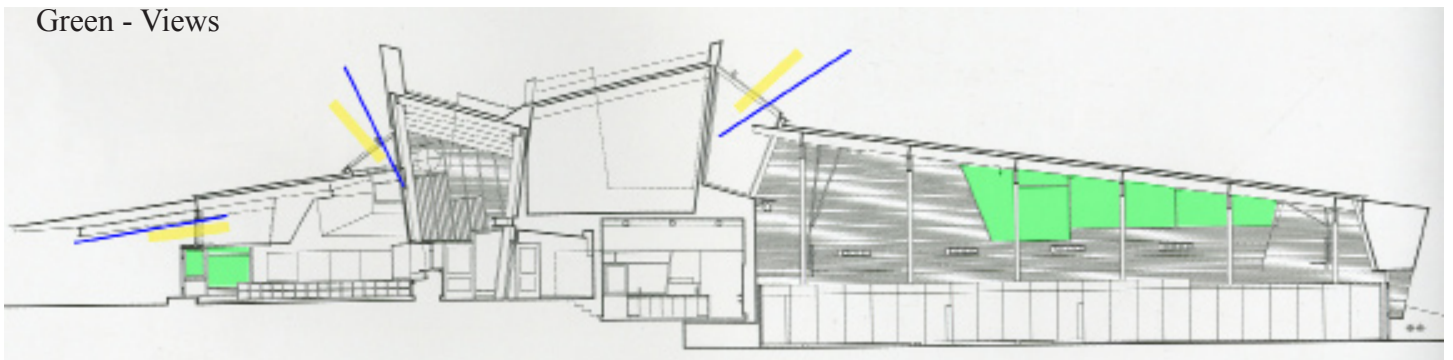
Strawberry Vale Elementary School



Yellow - natural light

Blue - ventilation

Green - Views



(Patkau Architects)



Strawberry Vale Elementary School

The school also started to look at new technologies in the learning environment. The meandering hallway that connects the clusters together allows for technology carts and media carts to be transported from one room to the next. This allows for less space within each classroom to be taken up by computers and screens and also less energy being used up per classroom.

Materials for this project were selected with sustainability in mind, therefore wood was chosen to its availability at the site. Wood was used for most of the cladding materials but the main structure is steel to reduce the use of what is called first-growth lumber. As you can see in the image above, the designers put together a well balanced material palette with beautiful wood grain cladding mixed with the pure white framed windows and the concrete structural elevation steps that cut in to the earth allow for the different levels.

The interior, as was pictured on the previous pages, was chosen to level all but the necessary spaces unclad. This design idea not only cuts down on material usage but also exposes the different systems of the building. This in turn allows the school building itself to become a tool for learning about structural systems, mechanical systems, and moment connections between materials coming together. Some of the spaces like in the classrooms required gypsum wall board to reduce noise and close off electrical wires for safety. The roof is made up of metal clad shifting planes that allow low angle light in during the colder months and shading light during the warmer months when the sun is higher in the sky.

The whole building is not only a showcase for school design ideas, but is aesthetically pleasing to look at. This case study was one of the best to see and increases interest in the coming design effort.

Case Study Summary

My topological research led me to two main literature pieces one being called *School Builders* and the other called *Designing the Sustainable School*. These books were hundreds of pages filled with past projects done all around the world. These projects were all schools that lead the way in the profession of school design. Some of the projects were even as old as the early nineties when questions of school design started shifting to more modern ideas. My theoretical premise/unifying idea posed a question, does the space we inhabit affect our ability to learn? Throughout the research I had found this to be true and researched this in previous portions of this program document. The goal for this section was to review projects that have been done in the past and to gain ideas of what professionals out in the career field have been trying.

The number one thing I've found in my research is that schools must find a connection to the environment. All of the case studies that I reviewed were filled with natural light and ventilation. The use of windows to bring in light and views out to nature was apparent in every design. The exterior walls become extremely important and become the sometimes thin barrier between the interior space and nature. The choices we as designers make on the exterior cladding and structure become very influential on a child's mind. These building envelopes all varied in materials and size and shape but all were very delicate with how they let nature in.

Another very apparent design technique is to allow every classroom an exterior wall. With the emphasis so much on that connection to nature you cannot allow some spaces that pleasure and not others. The use of clusters and pods were found in many school designs and with some success allowed all rooms to have some exterior connection. This design idea sometimes requires a great deal of circulation space but some of the cases studies accomplished this using unique shapes with flexible interior spaces which deleted the need for some of the circulation. The hard thing about school design which was discussed in earlier research, is that the school board's spacial requirements does come into affect and sometimes drives the design into certain directions. In some of the case studies it was apparent that there were less restrictions on the spaces where others you could tell that there were boundaries set up by the local governing board. The number one thing that suffered was the flexibility of spaces.

Another very important aspect of every design was the roof. Almost every case study that was reviewed utilized the roof as another cladding system and another chance to bring in natural ventilation and light. A common practice in many of the designs was to take the roof and break it into varying sizes of planes and then shift them vertically to create glazed openings between them. Those shifted planes allowed the designer control of which spaces needed more light and which needed less. Also, this was an important place to consider the orientation of the building and these shifted planes also doubled as passive heating and cooling systems. The roof allows you to set a depth of shadow so in the warmer months the light doesn't penetrate as much where in the cooler months the warm light dives deep into the space. This light control helps cut down on energy costs from artificial lights, but also once again becomes another way of keeping the occupant connected with the natural environment.

It became apparent through my typological research that schools should become green architecture. It makes sense with all the talks about connections to the natural environment that we as designers try to lessen our impact on that environment and allow nature to remain for all generations to enjoy it. This insight will need to be addressed and will become a requirement for my project. With the school becoming a tool for education and not just the place where education happens, we must use this tool to showcase new and modern ideas on how architecture can interact with nature in a safe way. The buildings in the case studies all made a point to carefully place the building within the site not just on the site. The use of varying levels allowed for less cut and fill, and in some cases the shape of the building was driven by natural elements of the site like trees and rocks.

This typological research has helped me realize important aspects of school design. I believe that I will be able to take some of these ideas and come up with my own theories and connect them to my site up in the Beartooth Mountains. I look forward to continuing on into the design phase and exercising what has been learned throughout my research. My site will provide a wonderful palette to engage and explore the possibilities that can come from the natural environment and it is exciting to think of the wonderful spaces that will come from these theories and ideas.

Historical Context

The site I chose for this exploration of the learning environment is Red Lodge, Montana. Red Lodge is a smaller rural community that sits along the base of the Beartooth Mountains. These mountains are a small section of the Rocky Mountains and straddles the boarder between Montana and Wyoming. The town is now know for its beautiful trails and its winter resorts, but it wasn't always that way. I look forward to the look back into such a historical town.

Before there was any breaking of the ground and way before there was any settlement there were beautiful rolling hills at the base of the Beartooth Mountains. Known for its 22 peaks over 12,000 feet of elevation this land was desirable to everyone. The Crow Nation was the first to use the land and called it home. The Crow Nation hunted at the foothills where wildlife thrives still to this day and fished in the cold mountain streams. You can still go out and find artifacts left behind by these older cultures. Slowly the tribe was pushed away from the land by settlers. As the numbers of settlers grew, the Crow Nation started to move away and by the 1920s the nation became less apparent in the area. The town still celebrates the culture as the first to settle the land and invites members of the tribe to join in parades and other celebrations though mostly for novelty value.

One of the first structures in the town of Red Lodge was a small log house built by a local legend named Edward Earl Van Dyke, or E.E. for short. E.E. was known as a true mountain man and lived off of the land before there was a community to support life. The harsh climates and the dangerous conditions made it tough on some of the early settlers. E.E became also known for his navigational talents providing guide services to the early settlers in the area. This great local character has had stories written about some of his adventures. One is about the time he was arrested for hunting in Yellowstone National Park, which to him wasn't a wrong doing. He was a true outdoors man and felt the land doesn't belong to anyone and anyone should be entitled to the goods taken from the land including hunting game. He is also well known for blazing a trail from Cooke City to Red Lodge, which goes through the mountain pass. Before this trail many visitors and locals alike wouldn't try to find their way through the legendary Beartooth Pass without a guide and the trail E.E. helped start is still visible today from the new highway's through the mountain pass.

E.E. also helped with mapping out the area including an eventual Crow Nation Reservation away from Red Lodge.

Slowly but surely more and more settlers were drawn to the location because of the beauty in the land. The settlers, with help from the locals, learned ways to live off of the land. Hunting and trapping were among the best ways to make a living while fishing also was popular in those times. The land was known to provide but also take away because of its dangerous rocky landscape and the extremes in climate change. There had to be a major event in time for any type of community to not only start but survive and soon enough that event was the coal mining movement.

Red Lodge was started by the coal mining movement. Much of Montana during this time was known for ranching, which led to the development of smaller communities with the majority of the people living out on the land. In contrast, Red Lodge was a mining community which pulled people into the town to where the money was to be made. It was the 1880's and there was money to be made in the coal industry. For this reason the town attracted people from all over the states and immigrants as well. The town became almost sectioned off where each portion was a small community of a certain background whether it be the Irish, Welch, or Yugoslavians. The town grew rapidly and by the beginning of the twentieth century the population grew upwards of 5000.

Another character in the history of Red Lodge was "Yankee Jim" George a pioneer hunter and prospector. George has been credited with the discovery of coal in the area and with the help of a few local men they started the Rocky Fork Coal Company named after the river that runs through the valley where Red Lodge is located. By 1887 this company had the area's first mine and not long after the town started to grow. This is the point where all those immigrants started to settle within the town and the population became to boom. Within several years there were multiple mines within Red Lodge's borders and individual companies ran each one. Business in those times were booming with lots of coal and a lot of people willing to work hard for a living. The immigrant settlers were probably a crucial part in the existence of Red Lodge because without them the coal mines wouldn't have had workers and the community wouldn't have grown. During this time the mines were digging 100 tons a day.

Historical Context

The work of a coal miner was a hard job with little to no light in the tunnels and bad air quality. In those times the equipment was all run by hand including the extremely heavy carts used to haul coal from within the mines to outside storage.

Red Lodge is known for its historic downtown which is rows of old store front buildings clad in brick for blocks and blocks on Broadway. The first building to start this historic section of Red Lodge was the Rocky Fork Town and Electric Company built in 1893. The building was also the first brick building in Red Lodge which stood for a sign of permanentness and good economic times. Since it was the first building in downtown Red Lodge the main entrance was placed on the corner of the building because the owner didn't know which street would become the dominant street through downtown Red Lodge. Soon after many buildings started being built and the town started to flourish.

During the great depression in the thirties, Red Lodge saw economic woes. The excitement from the coal mines was beginning to wear off and slowly the industry began to slow. Like other places around the country, some of the locals turned to bootleg liquor to help ease the troubles and pain. During this time many saloons and hang outs started to be organized and the whole town's moral was down.

Another important character in the story of Red Lodge is a physician named J.C.F. Siegfriedt. He decided that it was extremely important for the well being of Red Lodge to build a highway through the mountain pass in order to connect more of the smaller rural communities with in the area. He was certain that the highway would open up more traveling and bring in a certain level of tourism within the area. The beauty of the mountains was at that time fairly restricted to those capable of the hike but with a series of roads and trails, more people would be able to explore the mountain range and the beautiful views. In the beginning Siegfriedt was trying to privately fund his trails and roads, but soon ran out of money. He sought out the help of the government and soon congress was persuaded to allow the construction of a highway that connected Yellowstone National Park and Grand Teton National Park. In order for Siegfriedt's vision to come true he had to tie the idea into a federal case and what better way then to utilize the national parks system that was already in place. Convincing the government that the national parks

would benefit from more circulation and an easier way for people to explore them was pretty easy. The bill was signed later that year by President Herbert Hoover and the highway and series of trails were set for construction in 1931. When this bill was signed it triggered the largest celebration that the area had ever scene and the national interest in the scenic highway once again breathed life into the small community. A small company call Morrison-Knudson from Idaho won the contract to carry out the construction on close to 12 miles of switchbacks through the mountain pass. This construction of the highway also brought jobs to the community and to the area and benefited the local moral and economy. Workers traveled in from all over to help with the construction of this legendary highway. This brought people into downtown spending money after a long hard day at work in the mountains. These types of projects started by the government in hard times helped the economy by creating jobs and also helped the people by raising moral. The town was alive once again and on June 14th 1936 the highway was officially finished and the total cost was estimated at around 2.5 million. That was an enormous amount of money at that time and really helped spark the turn around for Red Lodge locals.

This legendary highway still today attracts people from all over to come and take a drive. The Beartooth Pass is known for it's steep incline and dangerous switchbacks. It is very common to find biker gangs making their way through the site as a sense of passage. The road gains about 5,000 feet of elevation within about 15 miles of road. Eventually the road would develop into what it is today with legendary switchbacks and gorgeous views. The road now is broken up by small viewing platforms along the way. The road wasn't officially named until around 2002 when it received a title of a National Scenic Byway and officially named the Beartooth All-American Road. I have personally driven this road twice in my life and there is no explanation of the beauty that opens up as you travel through the winding road. As you turn each corner adds another mountain peak into your view and the Beartooth Mountains seem to be like an onion, you slowly get layer by layer revealed. Surprisingly the railroad was one of the highway's biggest promoters because it decided to send out advertisements to tourists that they can take a train out to billings and then find a bus that would take you through Red Lodge and out into the Beartooth Pass.

Historical Context

Because of the interest in the highway Red Lodge became more of a tourist spot than anything else. The old physician was right from the beginning in that the highway through the pass would spark the community and it had.

Tragedy struck the small community in February 27th, 1943. The worst coal mining accident in the history of the state of Montana occurred at was then the Smith Mine. This tragedy in the end killed 74 people and was remembered for many years after. The explosion was caused by a build up of methane gas, common in coal mining if the air quality wasn't maintained. Several miners barricaded themselves in the main building and survived for a few hours extra leaving notes to their loved ones. This horrific event was felt around the community and around the nation with coal still being used everyday for a source of heat. The coal industry in the area couldn't survive the heartache though and closed for good shortly after. Coal mining, even though the tragic end, will always be remembered as what got the town started and is always considered a part of the Red Lodge culture.

Tourism has slowly become Red Lodge's main source of interest and income. Historical downtown Broadway is lined with shops of local artifacts and crafts along with nature being advertised as a past time. The locals started stocking the streams with trout and started finding trails through the mountains for day hikes, horse back rides, and during the winter months skiing. Because of the rich ranching history in the state of Montana, a annual rodeo was started in 1929 and has been continued for many years. The town started to organize celebrations to bring in visitors as well including many parades, dances, and gatherings. In the modern era the town even throws it's version of Sturgis where the whole Broadway is lined with motorcycles. The town itself has two bike shops where locals have worked and owned for many years.

The population isn't what it used to be during the mining years, but it has held steady above 2000 for the past ten years and has slowly increased since 2003. The town which was at one point completely contained within the valley has started to spread out to the tops of the benches on each side. The main developments have started on the West Bench where family homes have begun to be built and a golf course and country club have been built for many years now. The town is once again growing.

The Red Lodge school district has not had a huge history. The school district had two schools for the longest time, one pre-kindergarten through eighth grade school and one high school with ninth grade through twelfth grade. In more recent history the town has just finished a new high school on the north eastern side of town. The new school, just finished in the past few years, left behind an older building which was taken over by a middle school. The middle school is now connected to the elementary school where the high school once was. There are a few remnants of old school houses still around the town but have been outgrown and are privately owned or rented out by organizations such as a baptist church. The town is in need of a new school building, one that was actually meant to house younger children and not high school children.

Red Lodge is rich in its history and the town has a cool story behind its ups and its downs. The main thing is that the town is alive and the locals like to celebrate the history every chance they get. This will drive my design because with a small town setting like this, the school must allow the community use as well. The number one aspect of Red Lodge is their tourism, but there is a growing population living there year around. More and more people are being pulled to the beauty of the mountain views and are finding ways to make a living. As the town sits right now, there is still the historical section of Broadway that most of the outside world sees in their minds when they think of Red Lodge. Broadway has become the tourist facade for Red Lodge and it is the center of the town for all gatherings. There must be some way to incorporate the rich history and story of this beautiful area into a school design. It must not only speak of the mountains, but of the town that has survived there for almost 100 years now.

Goals

The number one goal of a thesis project is to declare a statement, research to find facts to back up the statement, and then create a design that portrays what has been learned.

I have been working on the first step for a long while now. Within everyone there is a wonderment about a topic and further more there is an opinion that people start to find with more and more experience. Throughout life I have now attended every level of the public school system and have seen many varieties of educational buildings but have never went to one that has enriched my experience. In my past most of the schools have been buildings that seemed that the actual purpose of the building was an afterthought. The buildings seemed more like prisons than schools with a high percentage of rooms not having any connection to the outside environment. This loss of connection with the outside world for many hours in the day has always bothered me. In this thesis I have set out to evaluate this problem and try to hypothesize my own solution.

The second step to this thesis is the research. The research will come in two main types; typological and theoretical premise. The typological will build a base of research about the physical natures of a school. These case studies will help me understand quantities of spaces and the types of required spaces. The theoretical premise research will include theories about the learning environment and the educational process. I will set out to ask questions about how humans actually learn and find out what effect the environment has on that process. My belief is that humans have a direct need to be connected with nature and that the environment can enhance our brain functions and in turn helping the learning process.

The third step in this process is the design. I will be setting out to design a school that combines elementary and middle-aged children while also serving the rural mountain community of Red Lodge, Montana. I decided if I was to find an understanding of how an environment can influence the learning process, I would pick such a beautiful environment as a site at the entrance to a large mountain range with a constant connection to water as well as it flows down from the mountain tops.

The academic goals for a thesis project is to complete the master's of Architecture degree. The thesis project is the final test and shows one's abilities to carry out research that develops into a well thought out design that accomplishes all the goals that we as designers set in front of ourselves at the beginning. The thesis project also will help me prove the skills I've gathered throughout the years of my college career.

This thesis project will allow me to develop my own opinion and hypothesis and in the end the product that comes from my work will be my addition to the debate out in the professional world. There are many designers out in the career that discuss the topic of school design every day and has been an ongoing debate within the architecture profession on what a school should accomplish for the students and the community. This project will help me create a voice for my ideas and will showcase my skills to others within the design community.

My goal is to learn a lot throughout this process, not only about the learning environment, but also about the educational process both in young children and in myself. I will set out to plan my approach and follow that plan. This plan will give myself the best chance at creating a successful design. I have already visited the site but will re-evaluate the site later on to try to connect with the environment once again. Nature has always been a part of my life with hiking and canoeing as a child to snowboarding and exploring as a young adult. I find myself re-energized every time I spend an extended amount of time within nature and I hope to help myself further understand this invisible connection. I will use a school design in Red Lodge as a tool to find out how this connection affects us on a daily basis. I have set out to find how the environment around us influences our abilities to learn.



Photo by Trevor Anderson

Red Lodge, Montana

Geographical Coordinates : 45 deg 11 min 15 sec N , 109 deg 14 min 55 sec W
Country : United States
State : Montana
County : Carbon
Land Area : 2.6 sq miles
Elevation : 5,568 ft above sea level
Population : 2,483 people : 1,199 Male , 1,284 Female
Average Age : 42 years old
Expanding City : 266 building permits since 2000
Average Household Size : 2 people
Percentage of Family Households : 51.8%
Time Zone : Mountain (MST)
Zip Code : 59068
Area code : 406

From miles away, the surrounding Beartooth Mountains come into view as you approach Red Lodge Montana. The main traffic into and through town comes from highway 212 which branches off of interstate 94 just west of Billings, Montana. Red Lodge is nestled into a valley between two geological benches labeled West Bench and the East Bench. These benches at the highest point are a 200 foot elevation change down to the valley in the middle. The valley which contains Red Lodge continues towards two mountain peaks creating the entrance into the Beartooth Pass, a highway known throughout the area, that weaves through the Beartooth Mountains. This pass is a local favorite for hikers, campers, and motorcyclists for its beautiful views and winding roads.

Red Lodge is a growing little town that is historically been located within the valley but is expanding up onto the West Bench. Downtown Red Lodge is a beautiful historic town with old brick store fronts lining Broadway for many blocks. The locals thrive on tourism traveling through the mountains, so the store fronts vary from old ice cream stores, local bike shops, and craft galleries. The town is only about 10 blocks wide and winds through the valley only about 25 blocks long. On the east side of town Rock Creek cuts it's way through, filled with clear and cold water from up in the mountains. Many little drainage streams are littered throughout the site and meet up with the dominate Rock Creek down in the valley. The mountains are always connected with the town from the views of the mountain peaks to the mountain streams cutting their way through the site.

The valley is filled with trees both coniferous and deciduous while the benches only find a few per acre and most of them were planted. In the fall the benches are a beautiful golden color and the valley is filled with reds and oranges with only a few trees still holding on to their green.

Macro



Micro



Local

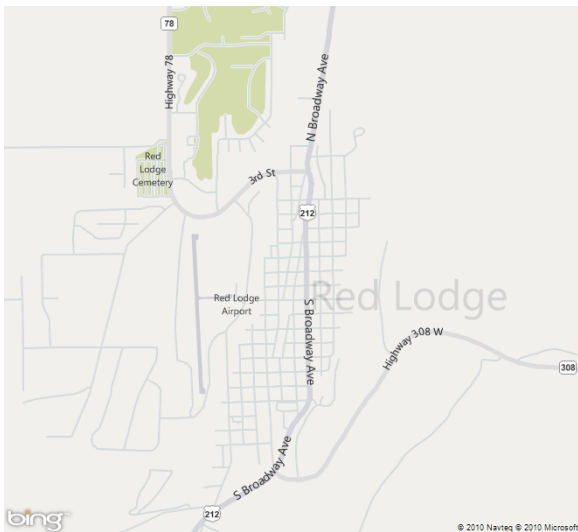


Site Analysis

Macro



Micro



Local



The site chosen for the new school is up on the West Bench. Branching off of Broadway is highway 78 which curves it's way up the West Bench with approximately 120 feet of elevation increase. The top of the bench feels like you could reach out and touch the mountains. The lack of trees opens up the site giving almost a 360 degree view of the mountain environment. Up on the ridge, highway 78 runs into a development section named Remington Ranch. This area and all of it's surroundings have been divided up and the expanding population has started building homes within this development. There is also a very small creek that runs through the western portion of the site and winds throughout the development and meets up with Rock Creek down in the valley.

The expanding population on the West Bench makes it a very good site for a new elementary and middle school. Schools, especially early child development, are a very important part of a community and will help the growth of the town. The site is surrounded by it's natural environment with views of the mountains and the connection to water with canals continually draining from the mountains. The constant flow of water not only creates a visual connection but a auditory connection as well. This will make a perfect site for an exploration on how schools and the process of learning is effected by the environment and what type of atmosphere if any can enhance one's abilities to learn.

The climates in Red Lodge will also provide a challenge for the design. The mountains have hot summers and very cold winters and storms develop very fast. The wind tends to swirl over the mountain tops but usually comes in from the west with the strongest averages during the winter months from January through May. In Red Lodge the people have learned to interact with the environment in all seasons. The people have developed a year around connection to the environment and the school must contain that same connection.

Red Lodge contains only one elementary school and one middle school right now. The town just finished a new high school and the old building was converted into the current middle school. Red lodge is a smaller community and could use a specific design intended to connect the children with the community and the environment around them.



Photo by Trevor Anderson

Mountain View Elementary School
311 South Oakes
Red lodge, MT 59068

- 135 students
- Public Preschool - 3



Photo by Trevor Anderson

Roosevelt Middle School
311 South Oakes
Red Lodge, MT 59068

- 131 students
- Public 4 - 6

Roosevelt 7-8 School
311 South Oakes
Red Lodge, MT 59068

- 77 students
- Public 7 - 8



Photo by Trevor Anderson

Red Lodge High School
800 North Cambridge
Red Lodge, MT 59068

- 179 students
- Public Grades 9 - 12

Red Lodge Schools

Other Carbon County Schools

Belfry, Montana

- Belfry 7-8 School
 - 7th grade to 8th grade:15 students
- Belfry High School
 - 9th grade to 12th grade:53 students
- Belfry School
 - Pre-Kindergarten to 6th grade:37 students

Boyd, Montana

- Boyd School
 - Pre-Kindergarten to 7th grade:7 students

Bridger, Montana

- Bridger 7-8 School
 - 7th grade to 8th grade:45 students
- Bridger High School
 - 9th grade to 12th grade:63 students
- Bridger School
 - Pre-Kindergarten to 6th grade:100 students

Edgar, Montana

- Edgar Elementary School
 - Pre-Kindergarten to 6th grade:26 students

Fromberg, Montana

- Fromberg 7-8 School
 - 7th grade to 8th grade:30 students
- Fromberg High School
 - 9th grade to 12th grade:54 students
- Fromberg School
 - Pre-Kindergarten to 6th grade:78 students

Joliet, Montana

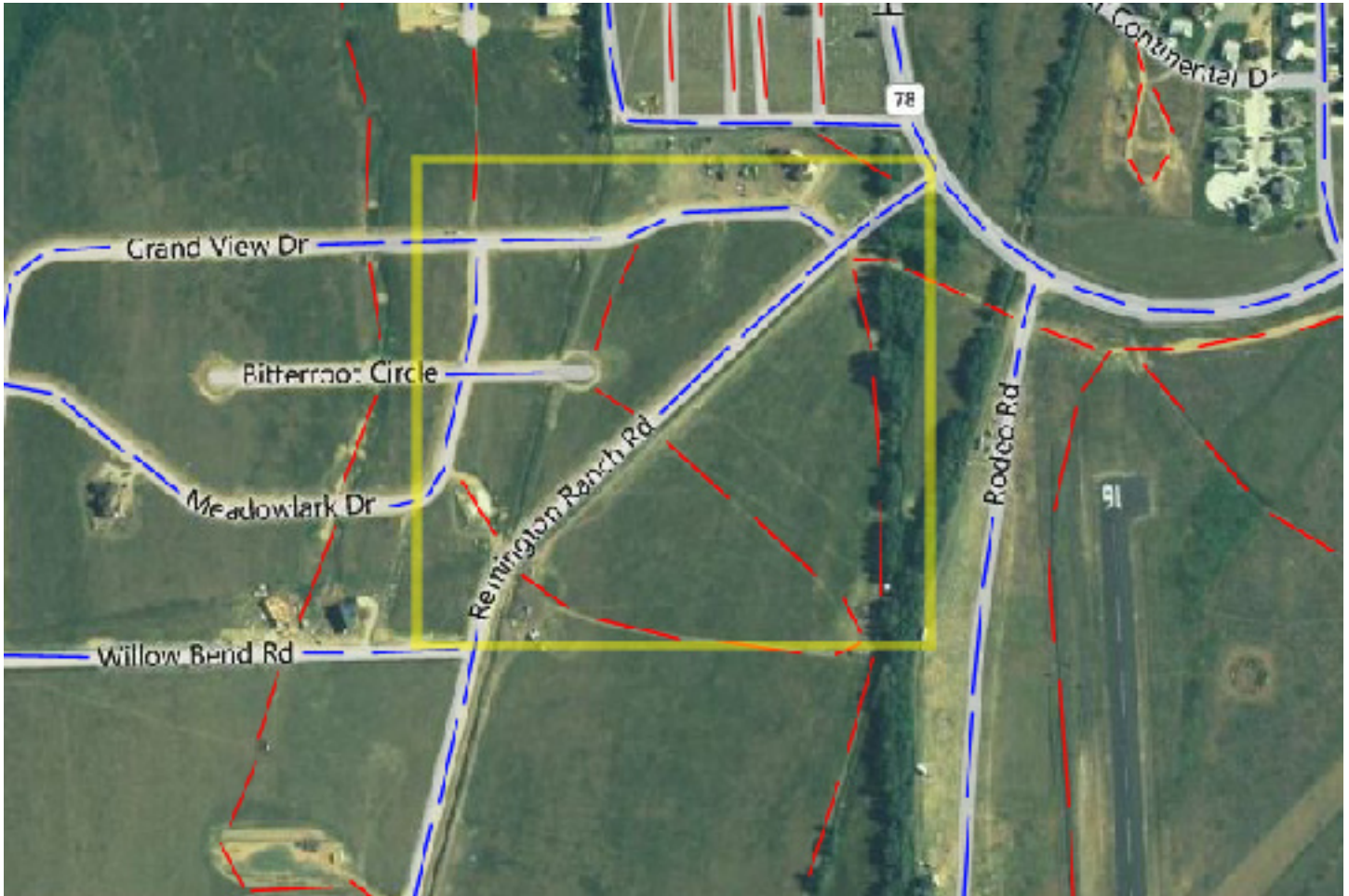
- Joliet 7-8 School
 - 7th grade to 8th grade:65 students
- Joliet High School
 - 9th grade to 12th grade:124 students
- Joliet School
 - Pre-Kindergarten to 6th grade:183 students

Luther, Montana

- Luther School
 - Pre-Kindergarten to 8th grade:38 students

Roberts, Montana

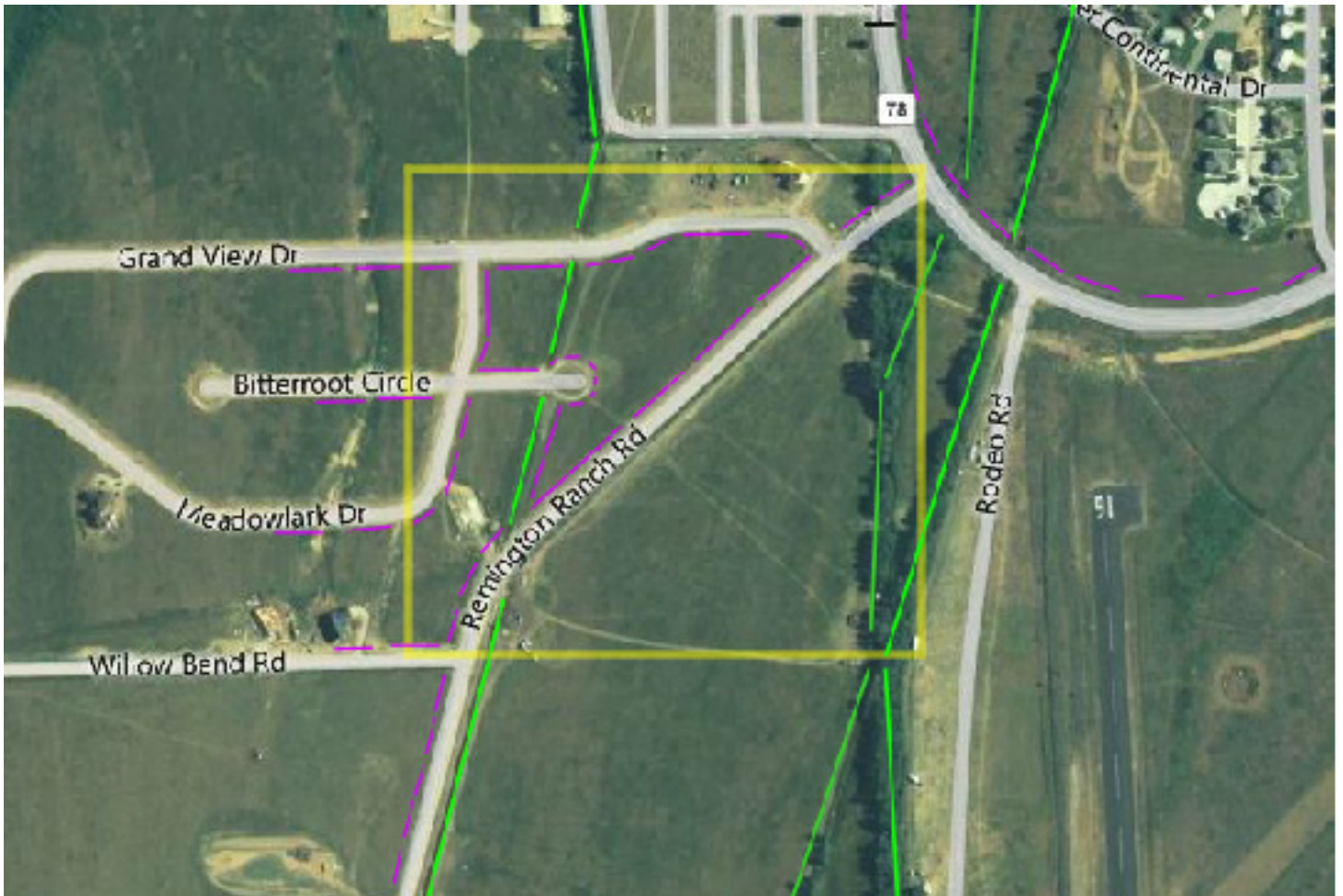
- Roberts 7-8 School
 - 7th grade to 8th grade:29 students
- Roberts High School
 - 9th grade to 12th grade:59 students
- Roberts School
 - Pre-Kindergarten to 6th grade:64 students



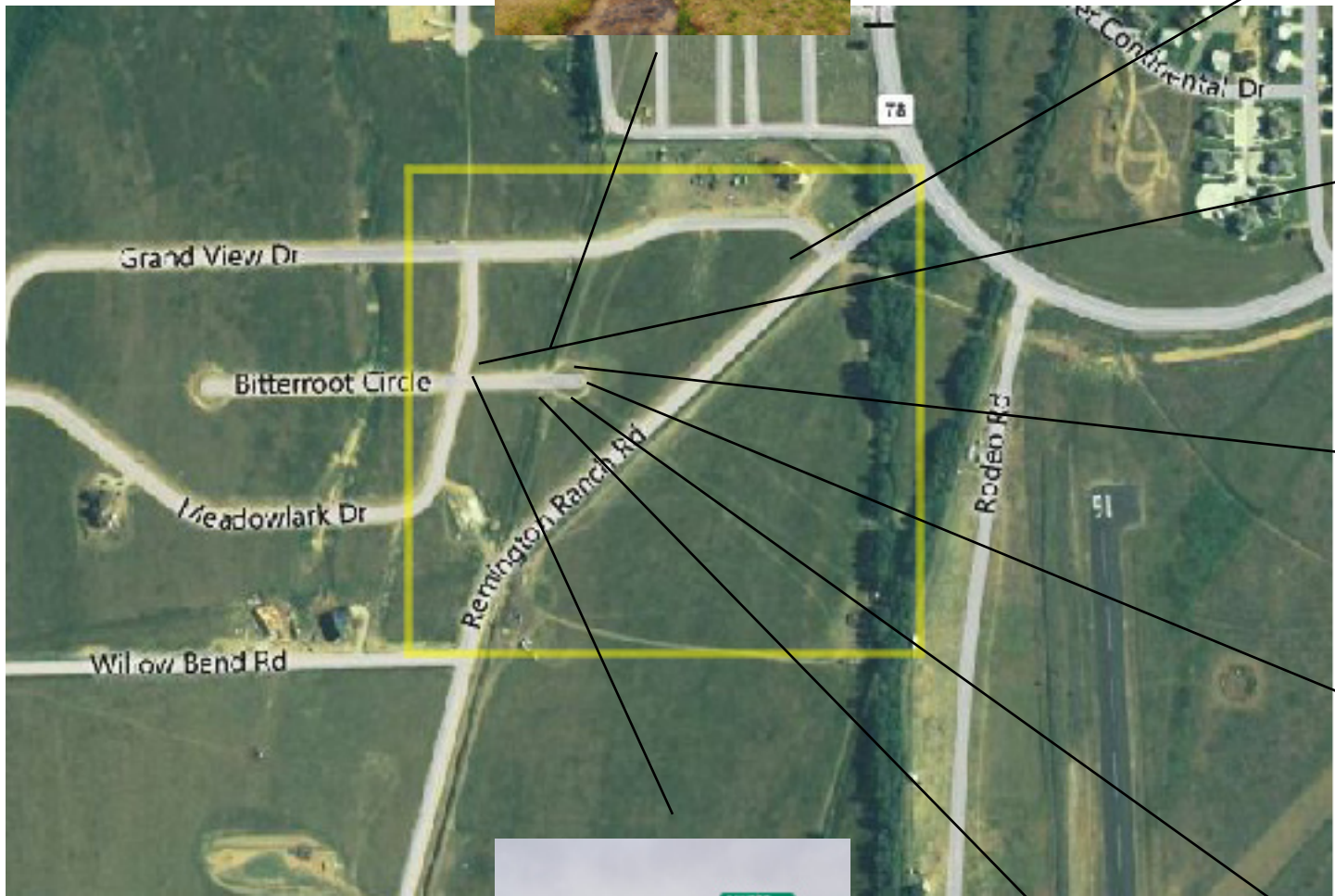
Yellow : Borders of the Proposed Site
Blue : Primary Circulation
Red : Secondary Circulation

Site Circulation

Site Utilities



- Yellow : Borders of the Proposed Site
- Green : Drainage Creek
- Purple : Buried Utilities (Power, Gas, Phone, Sewer)

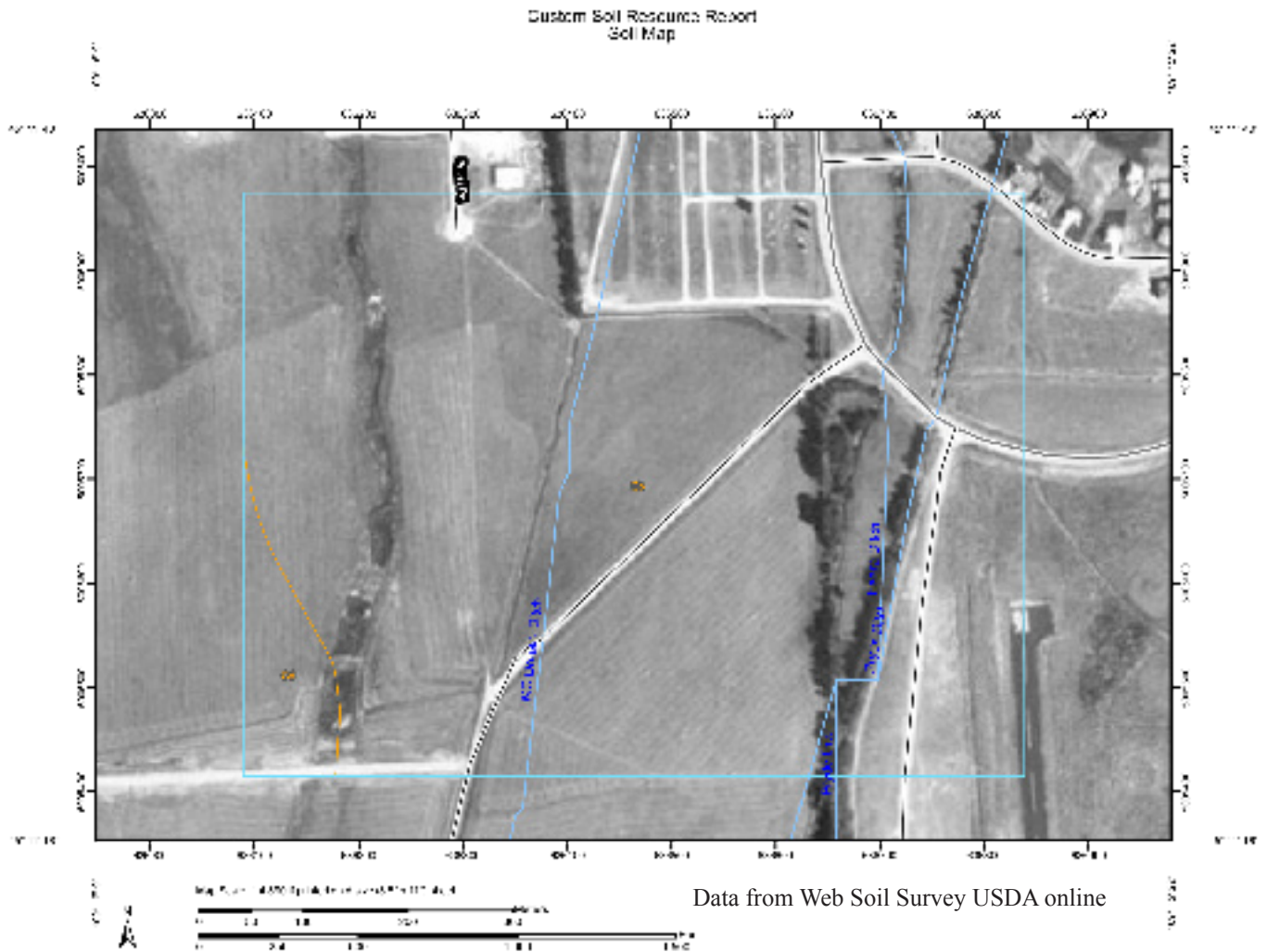


Site Reconnaissance



Photos by Trevor Anderson





Cb : Charlos Loam, .37 K Factor, 1 Slope Rating, 195 centimeters depth to water table
 Cd : Charlos Loam Wet , .37 K Factor , 1 Slope Rating , 107 centimeters depth to water table

95.9 percent Charlos Loam
 4.1 percent Charlos Loam Wet

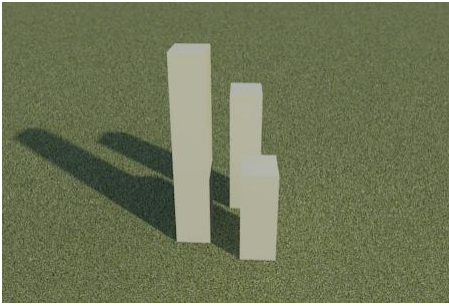
Typical Profile of Soil :
 0 to 6 inches : Loam
 6 to 17 inches : Clay Loam
 17 to 30 inches : Very gravelly clay
 30 to 60 inches : Very Gravelly sand

K Factor :
 .37 Low Erosion Possibility

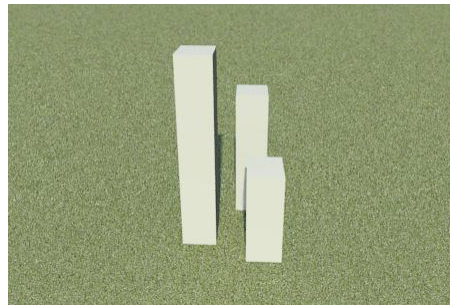
Slope :
 1 is a very low slope with very little elevation change

Soil and Slope Analysis

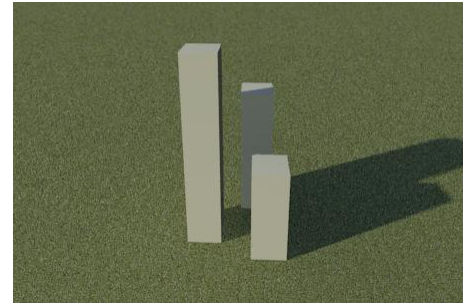
Fall Equinox



9:00 AM

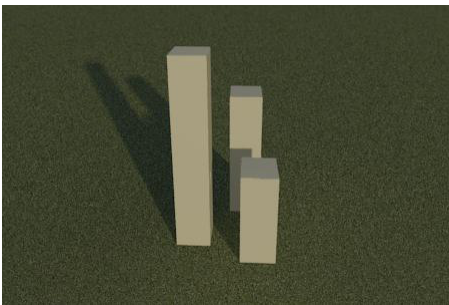


12:00 PM

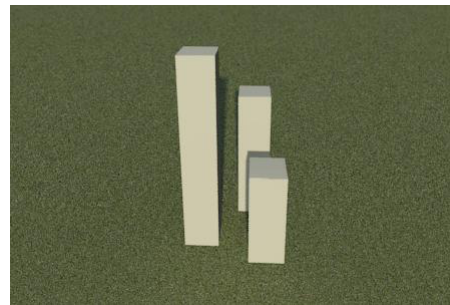


4:00 PM

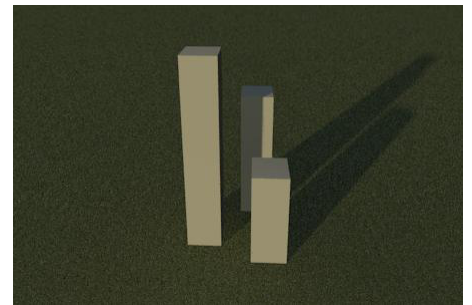
Winter Solstice



10:00 AM

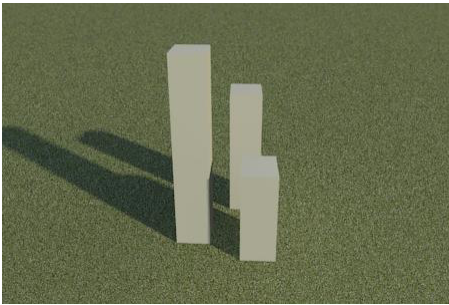


12:00 PM

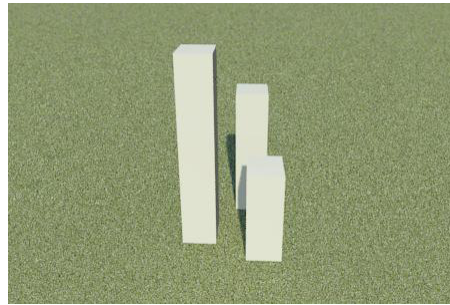


3:00 PM

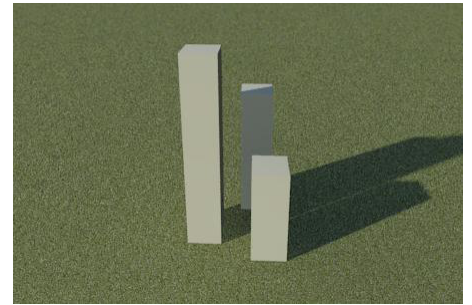
Spring Equinox



9:00 AM

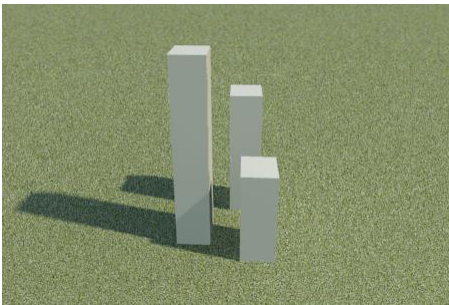


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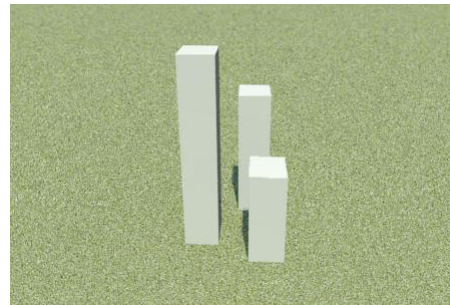


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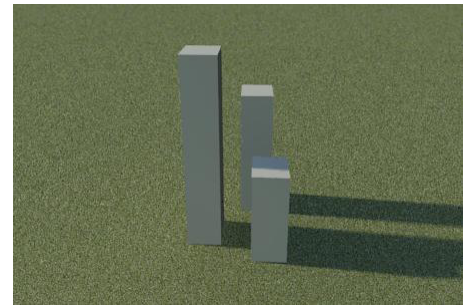
Summer Solstice



9:00 AM



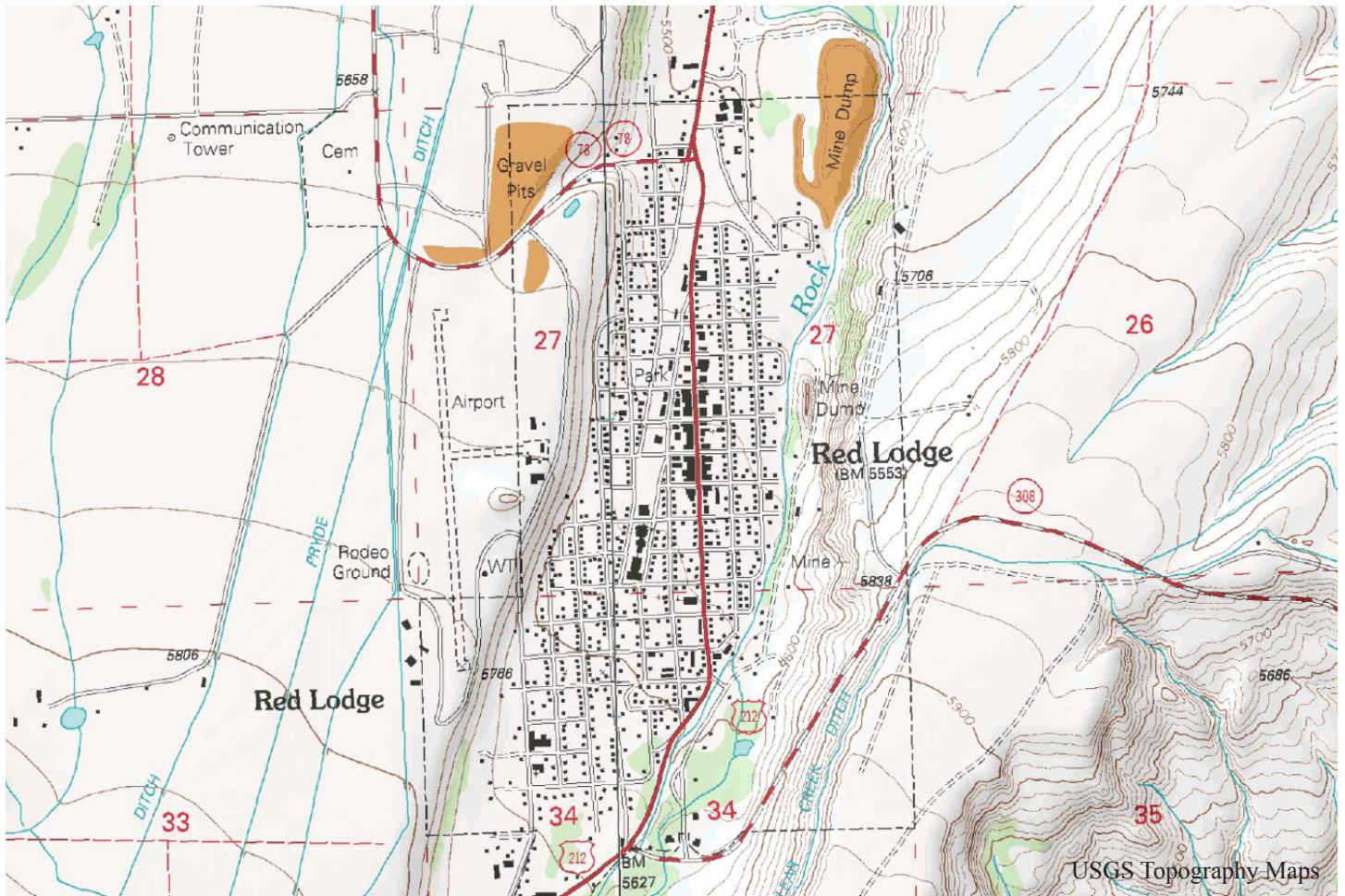
12:00 PM



5:00 PM



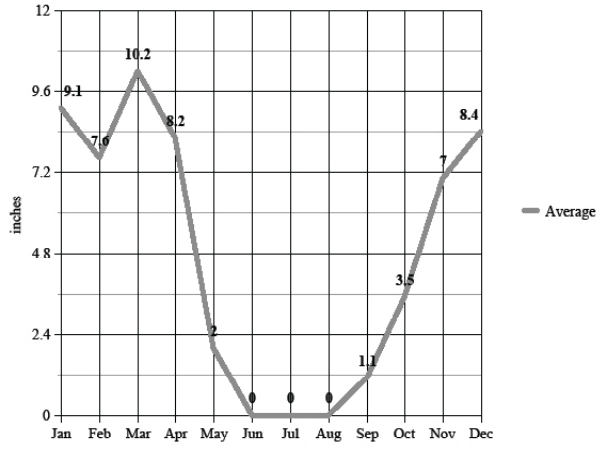
Sun and Shadow Analysis



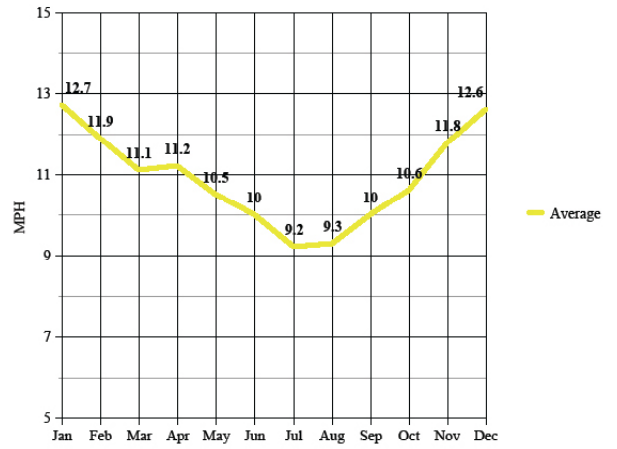
Topography



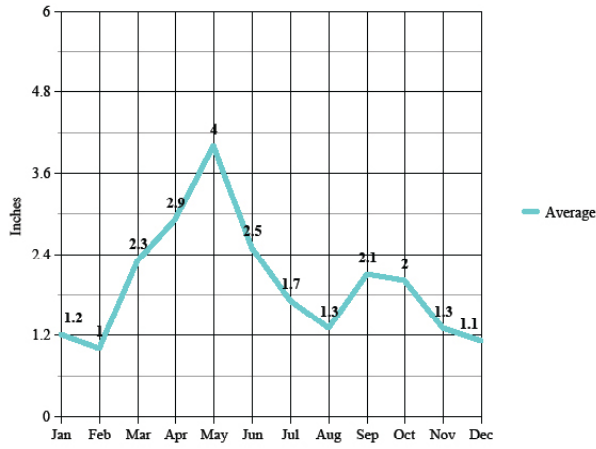
Snowfall



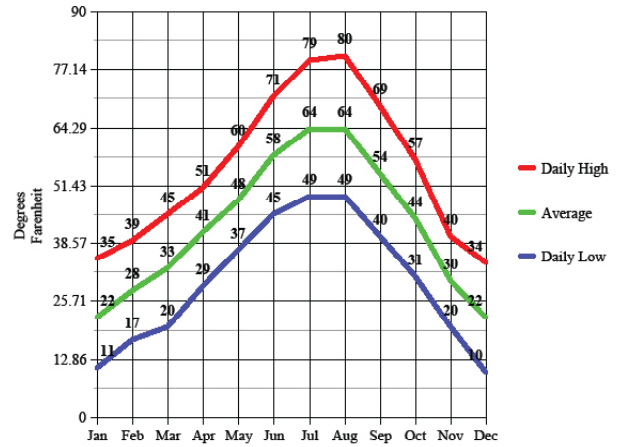
Wind Speed



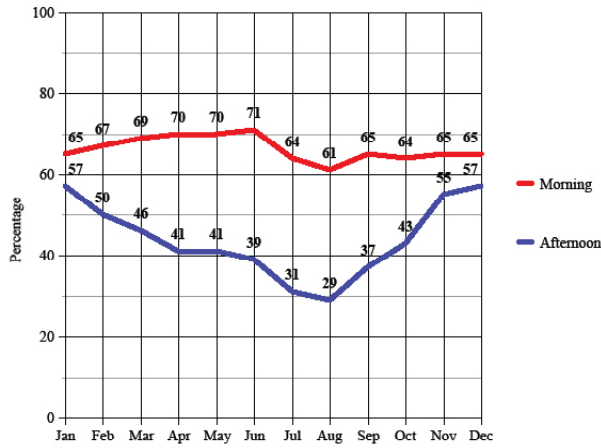
Precipitation



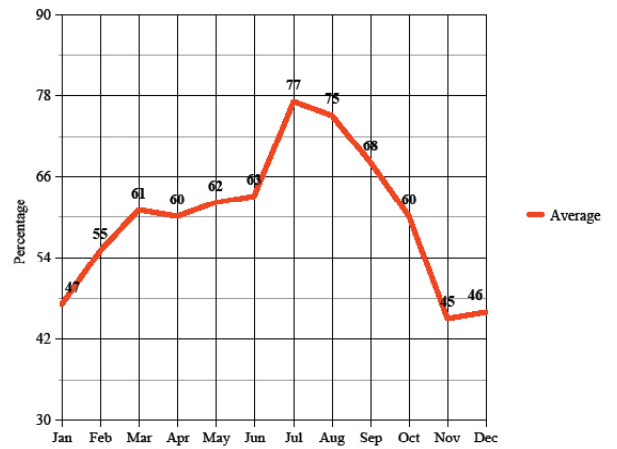
Average Temperature



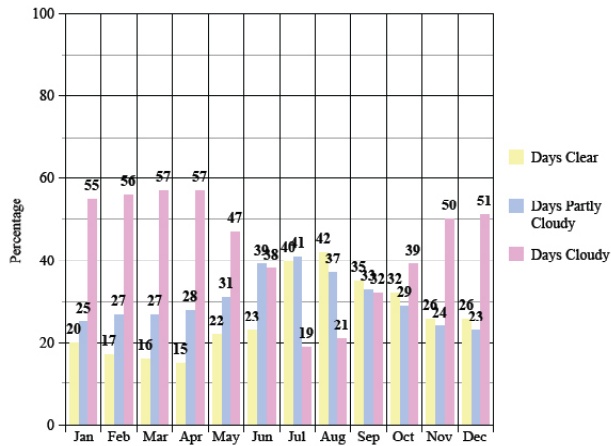
Humidity



Sunshine



Cloudy Days



Climate Data

All data for graphs found on www.city-data.com

Programmatic Requirements

Student Requirements

- 300 elementary students
- 200 middles school students

Spacial Requirements

- 82,000 sq ft approx. total

- Administration

- Waiting room - 400 sq ft
- Secretary/Reception - 100 sq ft
- Principal - 200 sq ft
- Assistant Principal - 200 sq ft
- Counselor - 200 sq ft
- Conference Room - 300 sq ft
- Copy/Mail Room - 300 sq ft
- Staff Lounge/Kitchen - 400 sq ft
- Staff Rest room x 2 - 400 sq ft

- Custodial

- 1,000 sq ft

- Mechanical

- 2,000 sq ft

- Circulation

- 14,000 sq ft

- Storage

- 1,000 sq ft

- Classrooms

- Kindergarten x 2 - 1,600 sq ft
- 1st Grade x 2 - 2,000 sq ft
- 2nd Grade x 2 - 2,000 sq ft
- 3rd Grade x 2 - 2,000 sq ft
- 4th Grade x 2 - 2,000 sq ft
- 5th Grade x 2 - 2,000 sq ft
- 6th Grade x 2 - 2,000 sq ft
- 7th Grade x 2 - 2,000 sq ft
- 8th Grade x 2 - 2,000 sq ft
- Reading Center - 1,000 sq ft
- Art - 1,000 sq ft
- Science Lab - 1,000 sq ft
- Music - 1,000 sq ft
- Technology Lab - 1,000 sq ft

- Food Services

- Cafeteria - 2,500 sq ft
- Kitchen - 1,500 sq ft
- Snack Area - 1,000 sq ft

- Outdoor Learning Areas

- 5,000 sq ft

- Library

- 5,000 sq ft

- Gymnasium

- 10,000 sq ft

- Fitness Center

- 2,000 sq ft

- Theater

- 2,000 sq ft

- Locker Rooms x 2

- 2,000 sq ft

- Rest rooms x 4

- 4,000 sq ft

- Commons/Entry

- 2,000 sq ft



Presentation

Program:

- Create a learning environment for Red Lodge, Montana
- 500 students - kindergarten through 8th grade
- 12 month school year with two 40 day breaks

Problem Statement:

- Can the quality of a space enhance someones ability to learn?

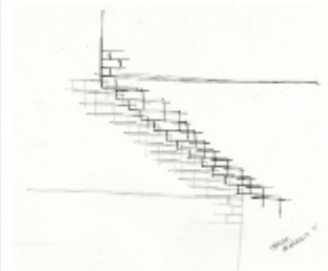
Focus:

- Finding a balance between old traditions of schooling with a new learning environment
- Building becoming a tool for learning
- Allow nature to drive design
- Raise awareness and set an example of how buildings should interact with nature
- Project becomes a center for the community to flourish around





Ethos



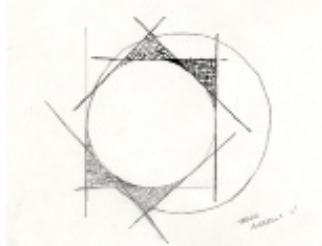
Tectonics & Craft



Purpose



Place



Ethics



Creating



Space & Form

Theory Sketches



Brain Based Education



Northern United States



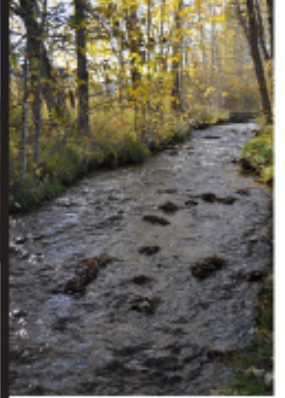
Montana, Carbon County



Entrance to Absaroka - Beartooth Wilderness



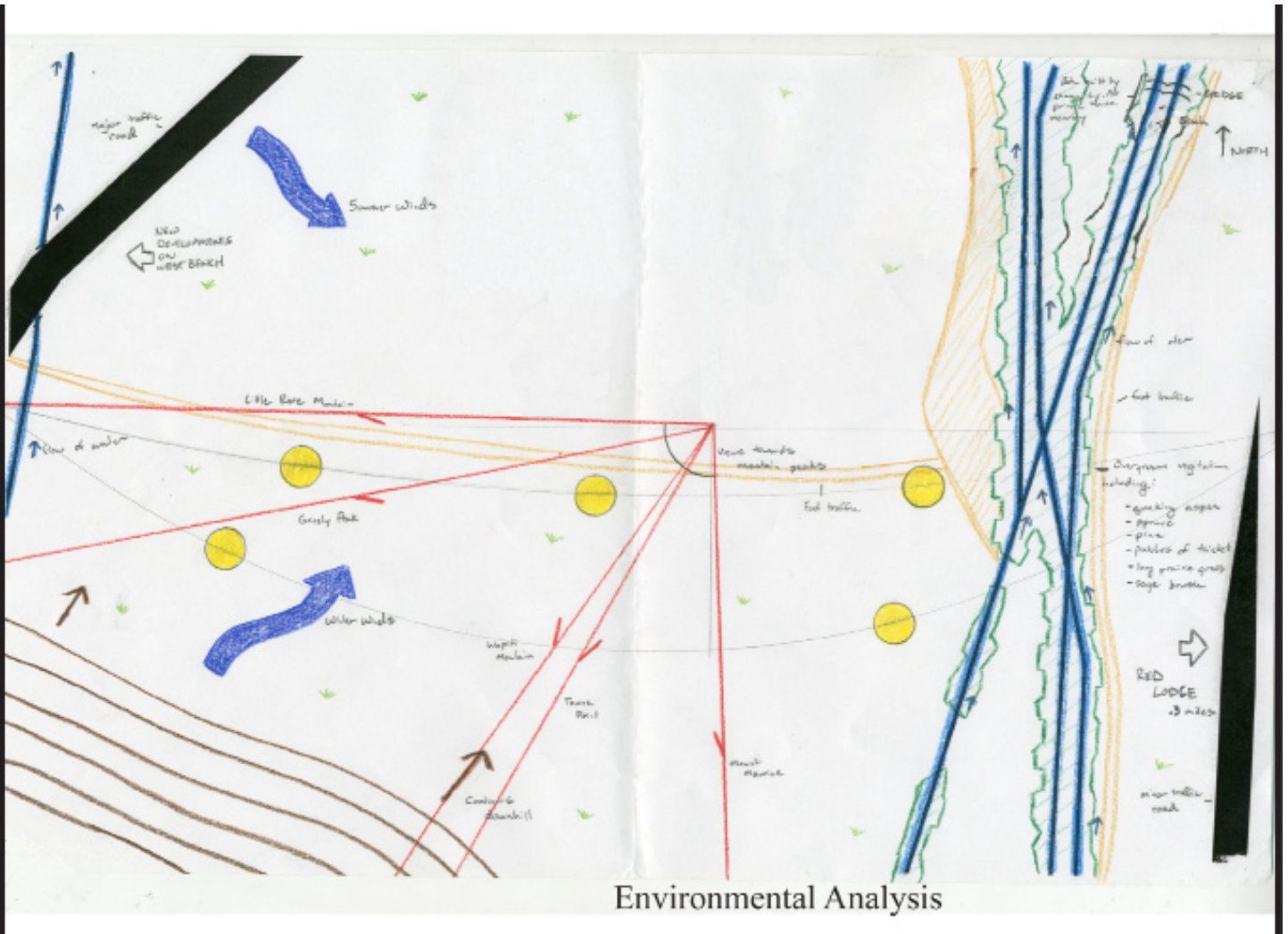
West Bench, Red Lodge Montana



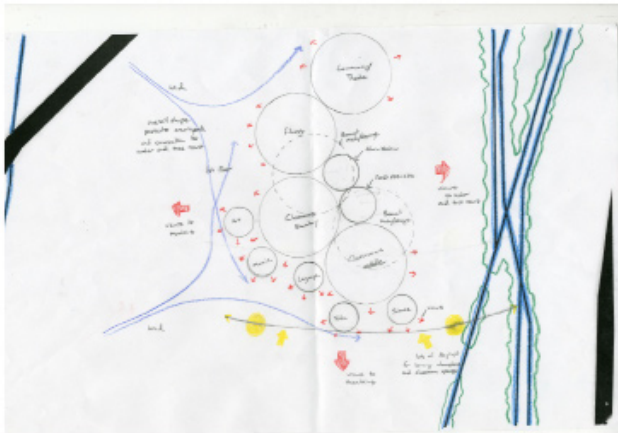
Red Lodge, Montana
October, 2010



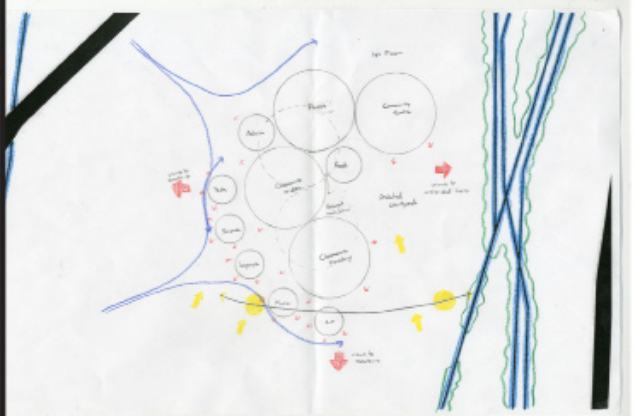
Red Lodge, Montana
February, 2011

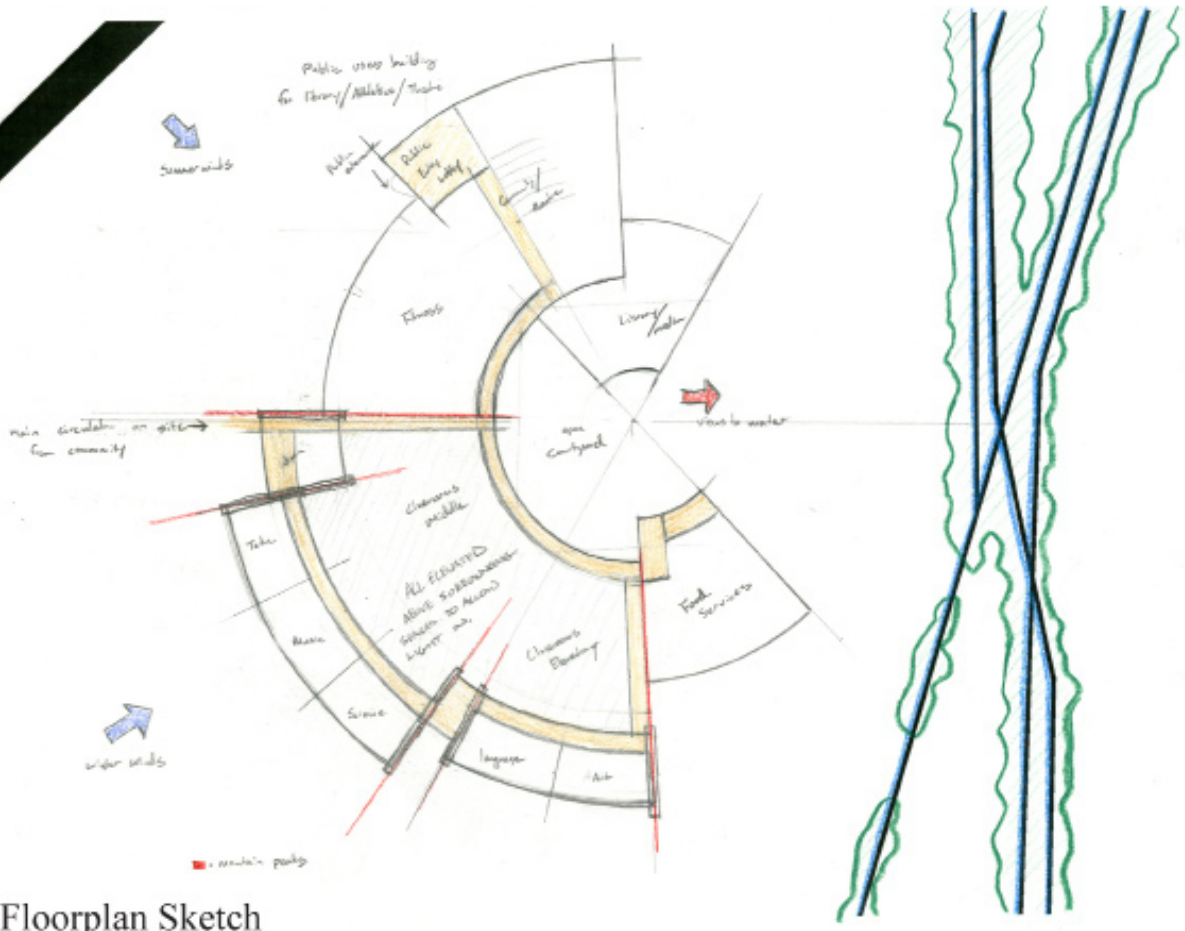


Environmental Analysis



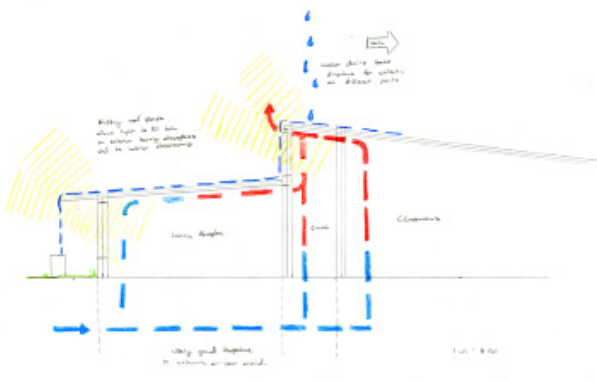
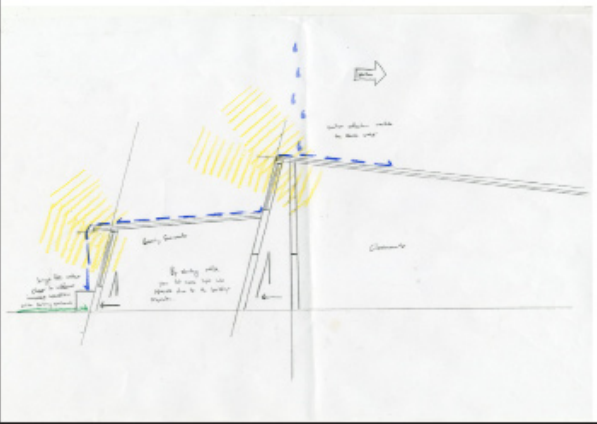
Spatial/Environmental Studies

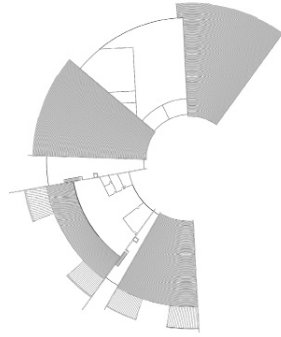




Initial Floorplan Sketch

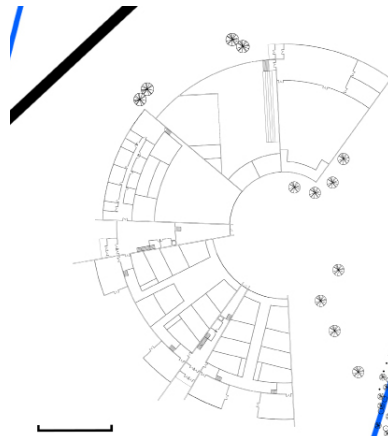
Sectional/Environmental Studies





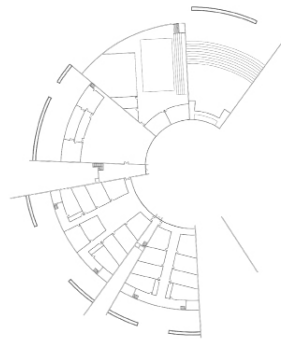
- Library Administration
- Technology Lab
- Library Stacks and Study

Second Floor
15 feet above ground level



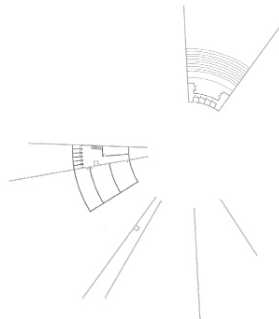
- Public Entry
- Flexible Theater Entry
- Community Rooms and Storage
- School Administration Offices
- Restrooms
- Main Entry
- Science Lab
- Restrooms
- Music Lab
- Secondary Entry
- Language Arts Lab
- Art Lab

Ground Floor



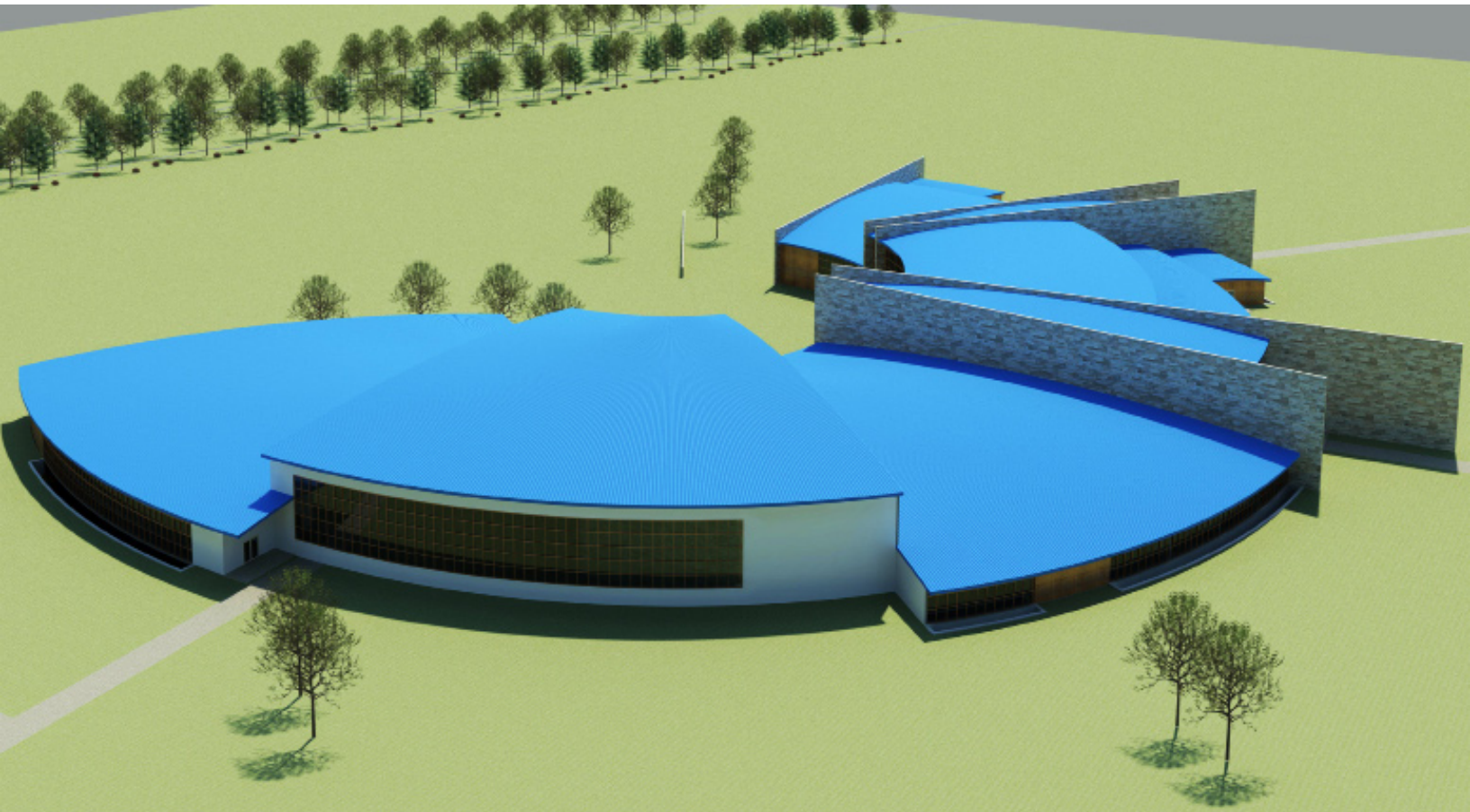
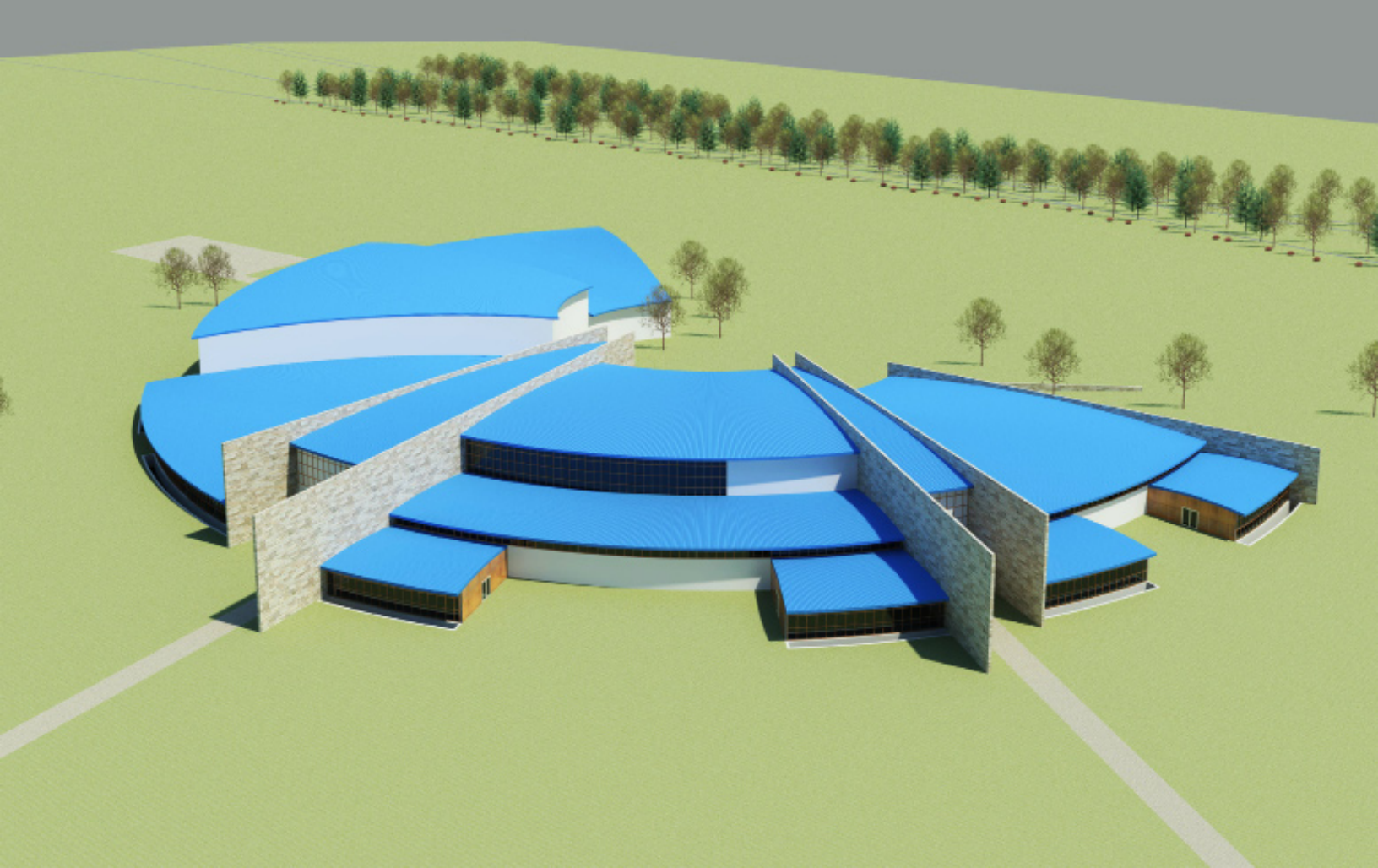
- Gymnasium
- Theater/Auditorium Seating
- Fitness Workout Center
- Locker Rooms
- Food Preparation and Serving
- Flexible Cafeteria Space
- Locker Area
- Older Classrooms
- Younger Classrooms

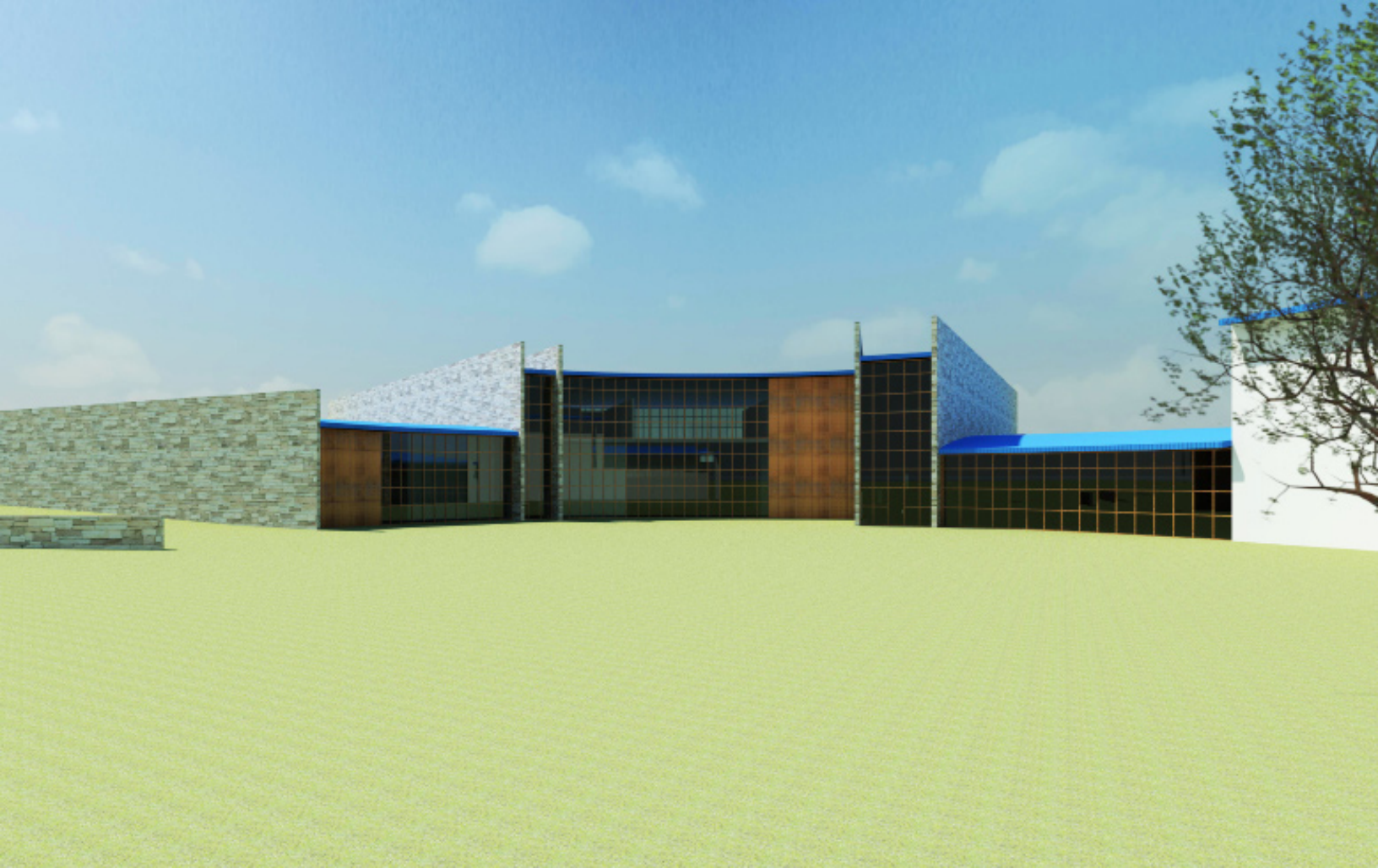
Basement Floor
5 feet below ground level

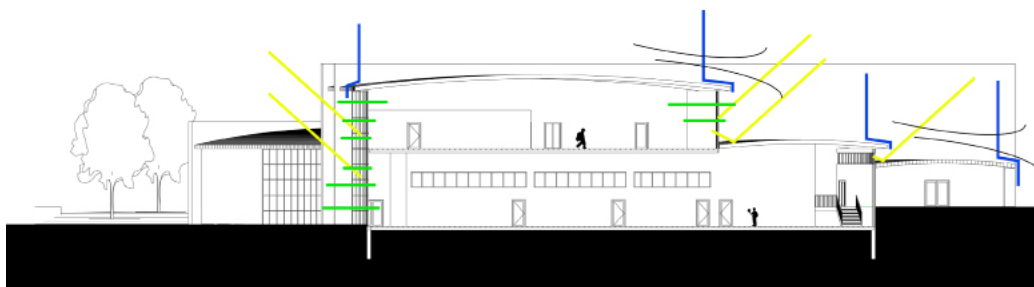


- Theater Stage and Storage
- Mechanical and Storage

Mechanical Floor
15 feet below ground level







Blue : Rain and snow collected and reused throughout the building

Black : Curved Roofs allow wind to pass over with limited disruptions. The wind then will create snow sculptures in the winter to study the aerodynamics of the building

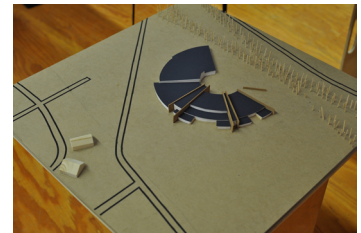
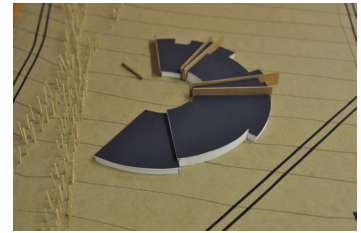
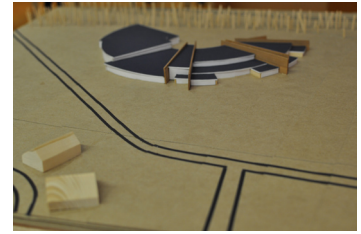
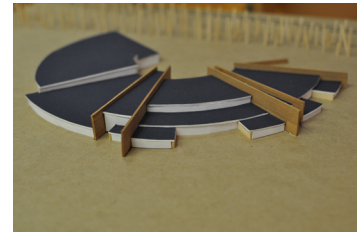
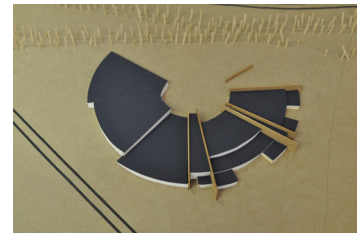
Yellow: Sunlight utilized for lighting throughout the building. Metal roof also allows for reflected light to enter deeper into the building

Green: Curtain wall systems allow maximum views out of the building for the students to take in the natural environment. This also allows for passive ventilation controlled by the people within the building.





Final Boards



Final Display

Program Appendix A

Core Principles of Brain Based Education

- The brain is a parallel processor. It can perform several activities at once.
- The brain perceives wholes and parts simultaneously.
- Information is stored in multiple areas of the brain, and can be retrieved through multiple memory and neural pathways.
- Learning engages the whole body. All learning is mind-body: movement, foods, attention cycles, and chemicals modulate learning.
- Humans search for meaning is innate.
- The search for meaning comes through patterning.
- Emotions are critical to patterning, and drive our attention, meaning, and memory.
- Meaning is more important than just information
- Learning involves focused attention and peripheral perception.
- We have two types of memory : Spatial and rote.
- We understand best when facts are embedded in natural spatial memory.
- The brain is social. It develops better in concert with other brains.
- Complex learning is enhanced by challenge and inhibited by stress.
- Every brain is uniquely organized.
- Learning is developmental.

(Wilson, 2010)

Twelve Design Principles based on Brain-based research

- Rich, stimulating environments using student created materials and products are evident on bulletin boards and display areas.

- Places for group learning like tables and desks grouped together, to stimulate social skills and cooperative work groups. Have comfortable furniture and couches available for casual discussion areas. Carpeted and areas with large pillows for whom prefer not to work at a desk or table.

- Link indoor and outdoor spaces so students can move about using their motor cortex for more brain oxygenation.

- Safe places for students to be where threat is reduced, particularly in large urban settings.

- Variety of places that provide different lighting, and nooks and crannies. Many elementary children prefer the floor and under tables to work with a partner

- Change displays in the classroom regularly to provide a stimulating situations for brain development. Have students create stage sets where they can act out scenes from their readings or demonstrate a science principle or act out a dialogue between historical figures.

- Have multiple resources available. Provide educational, physical, and a variety of setting within the classroom so that learning activities can be integrated easily. Computer areas, wet areas, experimental science areas should be in close proximity to one another. Multiple functions of learning is our goal.

- Flexibility : This common principle of the past is relevant. The teachable moment must be recognized and capitalized upon. Dimensions of flexibility are evident in other principles.

- Active and passive places : Students need quiet areas for reflection and retreat from others to use interpersonal intelligences.

- Personal space : Students need a home base, a desk, a locker area. All this allows learners to express their unique identity.

- The community at large as an optimal learning environment: Teachers need to find ways to fully use city space and natural space to use as a primary learning setting. Technology, distance learning, community and business partnerships, all need to be explored by educational institutions.

- Enrichment : The brain can grow new connections at any age. Challenging, complex experiences with appropriate feedback are best. Cognitive skills develop better with music and motor skills.

(Wilson, 2010)

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“I thought NDSU would be nothing but a step along my journey, but it has surprised me as an adventure all its own”

- Trevor Anderson

Personal Identification