MSCTC REDESIGN

BRINGING HIGHER EDUCATION INTO THE 21ST CENTURY

JAMES SCOTT JAEGER

Figure 01 | *Cover Page*

MSCTC REDESIGN

BRINGING HIGHER EDUCATION INTO THE 21ST CENTURY

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

By:

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In Partial Fulfillment of the Requirements for the Degree of Master of Architecture

Cindy Urness   5/9/2019
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Primary Thesis Advisor   Date

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Thesis Committee Chair   Date

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FIGURE 03 | *GRAPHIC 1*

Colleges and universities are uniquely important to our future as a society as they harbor and cultivate the minds of the future generations of leaders. It's extremely important for these spaces to cater to learning and open thought and speech as this is how people improve upon their critical thinking and professional skills. However, the models currently being employed for these buildings and campuses are often inadequate and have become outdated, no longer properly suited to their purposes. This next generation of leaders is therefore not reaching its maximum potential and countless innovative and new ideas could be lost because of these ill-suited environments.

This thesis will provide an alternative model to the current academic facilities that we have in our higher education system. Through improving the design of our educational facilities, we may be able to secure a better future, not only for the students occupying and studying at these facilities, but for everyone in our society that benefits from the thoughts and ideas that are produced there. Research was conducted with the aim of understanding what makes our current higher educational facilities so inadequate in their purposes and what precedents have been set in terms of the future design of higher educational facilities.

FIGURE 04 | *GRAPHIC 2*

Academic institutions are integral to the healthy continuation, growth, and advancement of a society. They play a major role in shaping the thoughts and ideas of entire generations of people, the same people who will then mature to inherit and form the society in which we all live. As such, it is of vital importance that academic facilities be well designed for these people to allow for the cultivation and expansion of their intellect and ideas to produce the best members possible for the benefit of tomorrow's society.

Many of the academic facilities we see today are not properly suited to their tasks of teaching the next generation of leaders. The buildings are often not adequately designed with what we now know to be healthy and efficient learning environments, thus stinting the learning potential of the students paying for and attending these institutions. Because of the previously mentioned relationship between society and higher education, this could have a potentially disastrous effect on our societal development as a whole.

For centuries universities have conformed to an outdated traditional model. It consisted mostly of simply sprinkling ornate monumental buildings about an overly large campus and filling the voids with visually appealing yet pointless landscaping. The separation of students from different schools of thought robs them of useful inter-professional collaboration. This traditional model also commonly takes a large plot of land and uses it rather inefficiently, not only wasting the space for the surrounding community but also wasting the space for the students inhabiting the campus. When technical colleges and trade schools became more prominent they chose to move away from this model due to its impractical nature, instead opting for a more utilitarian setup. This also proved to be a failure when considering the current knowledge available on what makes an effective learning space, as it failed to consider important design principles that create a healthy learning environment such as lighting principles, collaborative spaces, and general community-oriented living.

To create higher educational facilities for the future, it is important to learn from the current models in use to determine what the inadequacies are and how we can rectify them. Each model has its benefits and shortcomings, so the logical direction of design is to create a prototypical hybrid facility that borrows from both of these models, as well as adds previously unutilized design techniques to create a single effective model for the future. In doing so, a better future can be created for individual students and our societies which they shape.

In order to discern what makes a good higher educational facility I will be conducting research into previous successful iterations of universities and colleges, interviewing students and faculty at various institutions around the area, using my personal experience having been enrolled at North Dakota State University and Minnesota State Community and Technical College – Moorhead (MState), and analyzing trends and innovations in educational design.

The new MState building will remain an institutional building, however the program will also include spaces that are residential and commercial in nature. These typologies are often brought together in large university type environments, however this project will be much smaller in scale than that of a typical university, though it will serve many of the same functions.

Similar projects would include other educational buildings and campuses like universities, trade schools, and high schools. The purposes of all these buildings are closely related to the project in that they all focus on creating an efficient and healthy learning environment and focus on the students' needs above anything else. Apartment buildings will also share a few similarities with the new MState building. There will be a section of the program that has on-campus student housing and lobby areas, both of which are frequently found in apartment buildings.

The landscape on the site will be modified in some areas to better accommodate outdoor student activities and circulation. Some of this landscape will need to be converted into parking lots to contain the massive number of vehicles that will be present on the property during the normal school functioning hours, as well as for the on-campus housing.
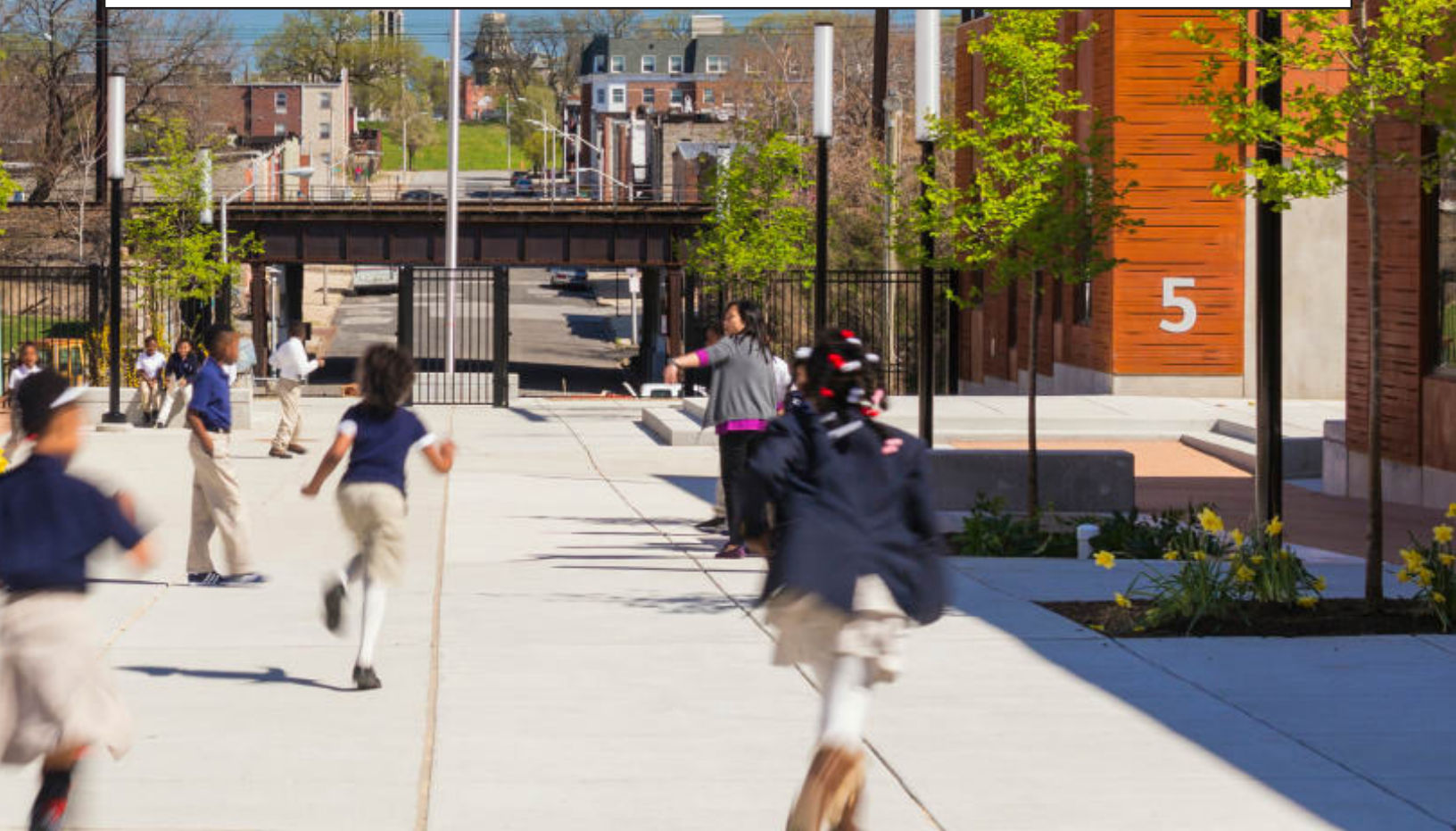
FIGURE 06 | *HENDERSON-HOPKINS EXTERIOR 1*

TYPOLOGICAL RESEARCH

E3 CIVIC HIGH SCHOOL

Typology: High School
Location: San Diego, California, United States
Size: 70,000 sq ft
Architects: LPA Inc., construction finished 2013

The e3 Civic High School project was designed with the intention of revolutionizing the way students receive and display information. A large part of this was creating "in-between spaces", spaces that existed between the typical programmatic spaces of the school. These "in-between" spaces are placed all around the school's two floors in an effort to encourage students to collaborate with each other and give them a space to express and focus their innovative ideas on the go. Since the beginning of the school's operation in 2013, e3 Civic High has reported that these have been a great success for their students and their educational micro-community and the school has won several architectural design awards.

The e3 Civic High School occupies the sixth and seventh floors of the San Diego Civic Center. The design of the floor plans allows natural lighting to reach all classrooms on both levels of the school, and the openness of the plans creates exposed collaborative learning and working environments. The circulation appears to be very intuitive and easy to follow. Precast concrete serves as the main structure of the building, allowing large spans ideal for housing equally large collaborative areas for its users. The interior of the school is very clean looking, following a strict geometric patterns and shapes not only for the plans, but for many of the smaller details as well. The materials used for the interior are synthetic in nature and appearance giving the building a very modern and sanitary aesthetic.

This building contains great examples of implementing flexible and customizable collaborative spaces into educational design and is evidence that such design is beneficial to the educational experience of its users. The "in-between" space is an idea that would greatly benefit this thesis' emphasis on fostering an enriching and social and higher educational experience. There are lessons to be learned from the floor plan layouts as well, allowing large spaces for students to relax, communicate, and study, as well as inviting natural lighting into every classroom. Lastly, this thesis could benefit from the same use of intuitive circulation, maintaining simple and easily navigable spaces.

FIGURE 07 | E3 EXTERIOR

F I G U R E 0 8 | *E3 P L A N S*

The floor plans above clearly show the layout of the building, which appears to be based on a grid system likely from the concrete structure. Most of the classrooms are able to receive sunlight during the day. The circulation path leaves plenty of room for the collaborative spaces pictured below.

F I G U R E 0 9 | *E3 I N T E R I O R*

HENDERSON-HOPKINS SCHOOL

Typology: Elementary School
Location: Baltimore, Maryland, United States
Size: 125,000 sq ft
Architect: Rogers Partners, construction finished 2014

The Henderson-Hopkins Elementary School was designed with community as its guiding principle. The campus consists of several small "containers for learning", or small self-contained educational buildings that belong to the larger campus. In the middle of the campus is a public shopping mall, bringing new life to the impoverished community by integrating the school with the community and thereby increasing educational awareness and participance. The buildings on the campus also conform to the surrounding context of the streetscapes by crating walking paths and roads extending through the campus, further supporting the public and strengthening community interaction with the school. The design seems to be a success and has won multiple architectural design since the school's opening in 2014.

The Henderson-Hopkins School is organized into sections divided by pedestrian walkways lined with green space and vegetation. Each of the sections has a number of small concrete and steel constructed buildings, each functioning as its own independent classroom and lobby area (as well as necessities like restrooms and storage areas). Most of these individual buildings have access to outdoor courtyards with green study space for the young students. The entire campus features a very interconnected yet open design and is arranged in such a way that each classroom has access to natural lighting. The design of the entire site mimics the surrounding old brick houses and neighborhoods to blend into its site and continue a coherent context. Although the campus does not sport any buildings with more than a single level, different buildings and parts of buildings have been raised among the rest to create a sort of hierarchy that help users identify buildings when wondering the campus.

The value of this project lies mostly in its campus organization and its integration with the surrounding context. These are essential principles when trying to create a community-oriented school. The use of green space in this project is an excellent example of how to utilize exterior spaces to both the school's and the community's advantage while maintaining a safe learning environment. The shopping mall in the center of the campus is another great way to engage the community and bring life back into a quiet or dying neighborhood.

FIGURE 10 | *HENDERSON-HOPKINS EXTERIOR 2*

FIGURE 11 | HENDERSON-HOPKINS PLAN

When viewed in plan the site's street-scape inspiration is apparent in the design. The circulation paths are very strong in this project, and the use of landscaping brings a feeling if life not only to the immediate site, but also the surrounding context. The large windows in each of the "learning containers" allows for plenty of natural light to penetrates the buildings as seen below.

FIGURE 12 | HENDERSON-HOPKINS EXTERIOR 3

Typology: Trade School
Location: Peterborough, Ontario, Canada
Size: 87,000 sq ft
Architects: Perkins + Will, construction finished 2014

Kawartha Trades and Technologies Centre was designed to emphasize program visibility, innovative technology, and collaborative learning. It combines some of the newest available technologies with the most up-to-date educational practices to create an optimal learning experience for the students and a great work experience for the faculty. Presentation and collaborative areas are integrated seamlessly with the main lounge areas of the building, offering a dynamic experience for the users. The visual design of the building was inspired by industrial type structures where students seeking degrees here would likely be employed after their graduation. Since opening in 2014, the building has been considered successful and has won many architectural design awards.

The Kawartha Trades and Technology Centre features large expanses made possible by its steel beam and truss construction, creating spaces for the students to practice real job skills in an appropriately sized environment. One of the building's most striking elements is the massive cantilevered flat roof that overhangs the entrance and entry plaza with a large circular hole cut through it to let through natural lighting. The building uses a combination of patina-ed steel and wood for its exterior visual aesthetic. The building has extensive glazing on the exterior walls, allowing natural light to penetrate deep into the interior. In the middle of the main lobby is what is referred to as the "teaching cube", which is a cluster of classrooms and other educational spaces arranged in a sort of ring shape. This "teaching cube" encourages student interaction with other students in the lobby area of the building.

This building's use of large practical maker-type spaces is exactly what this thesis project needs for the educational programs MState offers. Kawartha Trades and Technologies Centre also finds interesting and effective solutions for integrating teaching spaces within main lobby spaces which will be useful for this thesis project.
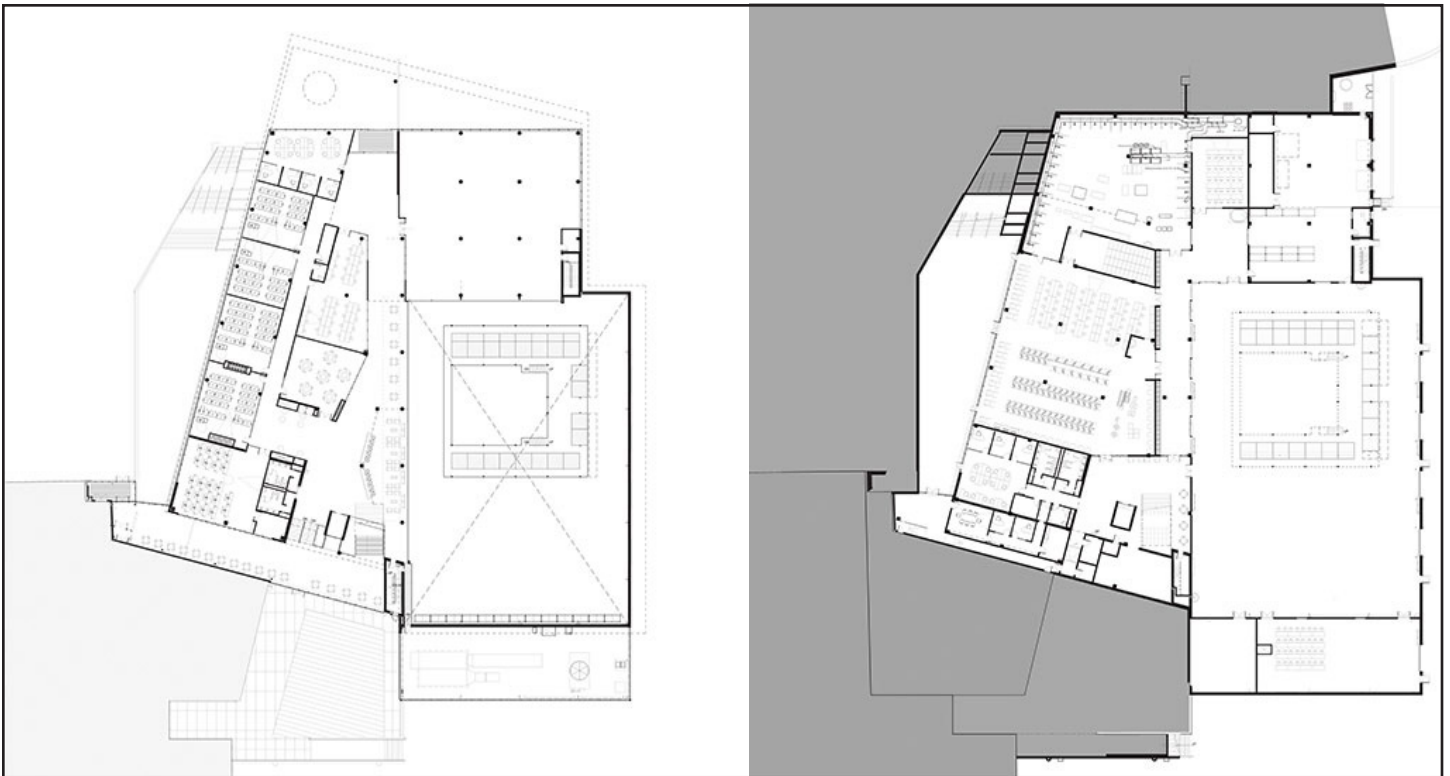

FIGURE 13 | KAWARTHA EXTERIOR

F IGURE 14 | K AWARTHA P LANS

In the above plans and in the below sections (2 in Section B), the "learning cube" can be seen in the northern portion of the clerestory lobby space. Even though the building is partially below-grade the inside spaces still receive an adequate amount of sunlight because of the depression in the surrounding plaza and the skylights. In Section B the maker-type space can be more clearly seen at 1, with garage doors leading to the exterior. This would be very similar to what this thesis would require.

F IGURE 15 | K AWARTHA S ECTIONS

Section A

Section B

FIGURE 16 | *Kawartha Interior*

e3 Civic High School, Henderson-Hopkins School, and Kawartha Trades and Technology Centre each display an aspect that is important to this thesis. e3 High School emphasizes the importance of collaborative learning and the implementation of innovative educational technologies, Henderson-Hopkins School provides an example of landscaping combined with multiple separately functioning buildings, and Kawartha Trades and Technology Centre has a similar program and function to this thesis.

Each of these award-winning studies provides a unique perspective on what makes an educational facility successful. Part of this thesis is about taking the best qualities of different projects and combining them into a single ideal project.

There were some basic design principles that were consistently displayed among the three typological studies, indicating they are of importance when designing educational facilities. Natural lighting is prominent in all of the studied projects. It plays a number of roles such as providing cost-free lighting during day time hours, improved mental health, and a visual connection to the outside or natural environment. Circulation is another prominent aspect of each of the projects studied. Circulation defines how users will experience and move through the building, it can alter the entire atmosphere of a place. All projects studied also emphasized student gathering spaces for collaboration, which can breed new ideas and refine thinking and skills.

Lobbies and Lounges: Lobbies and lounges accommodate students and faculty during their downtime, creating comfortable and accessible spaces for studying, relaxing, and student gatherings. These will serve as important nodes that connect the various circulation routes through the building.

Faculty/Administrative Offices: These spaces are essential for the day-to-day operations of the school and will be where the administrators and faculty spend most of their work days. Creating a healthy and appealing work environment will be top design priority for these spaces.

Classrooms: Classrooms are a vital part of the program, serving as the main learning spaces for the students. They should be visible and easily found from the main circulation. They should also be well lit with natural lighting and allow for adaptable seating arrangements to facilitate different teaching techniques.

Specialty Classrooms: These spaces are similar to the normal classrooms but are designed for specialized practices. These spaces will vary greatly in size, usage, and functionality.

Collaborative Workspaces: Collaborative spaces will be integrated within the main circulation of the building, allowing for easy access and creating an environment in which students can effortlessly gather and communicate with each other to further their ideas and thinking.

Library: A very important spaces for and academic institution, the library will house all of the texts available to the school and its students. The space will not only serve as the school's private library, but it will also be a public library for the surrounding neighborhoods. The library will also feature digital methods of storing and accessing texts.
Student Residence Building: The new school program will offer students an affordable on-campus housing option. This will create a stronger community amongst the students and therefore a healthier learning environment.

Dining Center: This space will offer students and faculty a place to eat between classes and during study sessions without having to leave the campus. This brings in revenue to the school and reduces incoming and outgoing traffic from the school's parking lot.

Exterior Landscaping: The school will consist of a few different buildings on the campus, so the exterior landscaping will be an important feature for this project. Outdoor study spaces and collaborative spaces will be provided for the users of the facility as well as sporting and other outdoor activity areas that will also be made available to the public.

Parking: With thousands of students enrolled at the school as well as hundreds of staff, faculty, and administrators, the parking will have to be expansive and the vehicular circulation will require a smooth flow.

Circulation: Circulation is a very important aspect of a large educational facility such as this. The paths need to be clear to new students and visitors to the school and properly accommodate heavy traffic flow during transitional class times. The circulation will also need to be connected to the exterior paths.

Students

Minnesota State Community and Technical College – Moorhead had nearly 6,500 students enrolled during their Fall 2017 semester, with almost 40% of those students being full-time (most recent numbers available). Since most classes are held between 8:00am and 4:00pm, the majority of the building's occupation is during this timeframe. Such a large volume of students demands a proportionally large number of parking spaces, especially when this project implements residential spaces for the students. Students enrolled here also come from a wide range of cultural and socio-economic backgrounds and may also need special accommodations for physical or mobile disabilities. All designs will have to be considerate and sensitive of this.

Employees

MState currently employs 515 staff, faculty, and administrators (most recent number available). In addition to the large number of students attending the school for their classes and other academic pursuits, the faculty will also be present in the building during the peak class hours of 8:00am to 4:00pm. The staff and administrators will likely be present in the building during the weekends as well. All of the staff, faculty, and administrators will need parking spaces or parking areas made available to them. The same cultural and socio-economic considerations should be made for the employees as the students.

Visitors

Visitors would mostly include guest speakers, potential students and their families, and visiting MState officials. The anticipated number of visitors is very low on a day-to-day basis, so only minor considerations are necessary for circulation and parking.

FIGURE 17 | GRAPHIC 4

This site is the current home of Minnesota State Community and Technical College – Moorhead. It's a large plot of land approximately 35 acres in area. The plot is bordered by residential neighborhoods on the north and west sides, Interstate 94 to the south, and an industrial area to the east beyond the train tracks. In the north-eastern corner of the plot is the south Moorhead Fire Department building on its own small parcel of land. The plot is framed by 24th Avenue South, 28th Avenue South, and 20th Street, a major roadway in Moorhead.

The existing MState building sits in the southern half of the plot and is surrounded by parking lots on all sides, but most notably on the west side of the building. Most of the northern half of the plot is open green space currently being used for sports fields with a small artificial pond in the north-western corner next to a residential neighborhood.

MState is a school that has been steadily growing and expanding for the past decade. It offers a large network of campuses across Minnesota with dozens of majors to choose from. It also offers some of the most affordable tuition in the state, with more then 50% of students attending tuition-free. These factors make MState a prime candidate for this prototypical thesis project; affordable, efficient, and practical.

MyState's extremely low tuition cap and flexible enrollment options offer a great model for the college of the future; however, the building is a bit out of date and does not display many good educational design principles. My goal with this thesis is to create a new model for colleges using MState's already solid educational foundation.
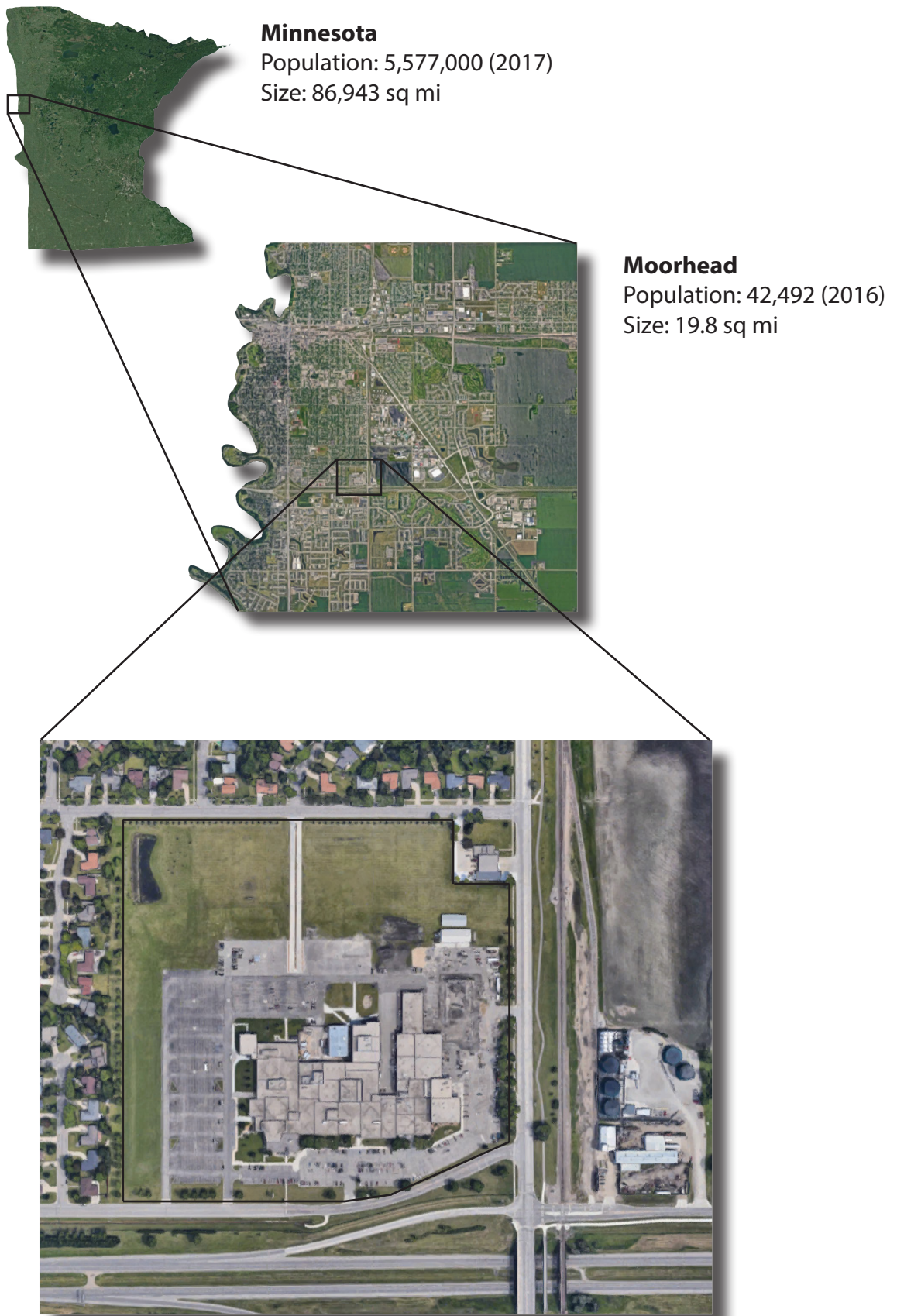

FIGURE 18 | MSTATE EXTERIOR

Minnesota
Population: 5,577,000 (2017)
Size: 86,943 sq mi

Moorhead
Population: 42,492 (2016)
Size: 19.8 sq mi

F I G U R E 19 | *S I T E M A P S*

Optimal Learning Environment: Creating a better leaning experience with the latest technologies and educational design knowledge available. Taking the most effective traits of the traditional university model and the smaller college/trade school models and combining them to create the best educational facility.

Fostering Community: Bringing the community and students together by allowing and incentivizing the surrounding community to visit and interact with the school and its students. This will create a healthier learning environment for both the students and the community, as well as build mutually beneficial relationships which open new opportunities for both parties.

Physical and Mental Health: The project's design will utilize new knowledge on the design of educational and office buildings such as natural lighting and circulation principles. This will contribute to an improved living, learning, and working environment for the students and faculty.

Designing for the Future: Researching and implementing new teaching and information distribution methods will increase the productivity of the students and faculty as well as revolutionize the way students interact with their peers and professors.

This thesis presents many opportunities for personal, academic, and professional improvements and contributions. Through extensive research and proper design implementation I hope to achieve the following goals:

[Professional] Create a practical prototypical model for the college of the future.

[Professional] Enhance the higher education experience for students.

[Professional] Bring students and community closer for mutual benefit.

[Professional] Challenge traditional educational design ideas in the profession.

[Personal] Refine personal research techniques and design implementation.

[Personal] Produce a solution that is personally and academically satisfactory.

[Academic] Create new knowledge on the topics being explored.

[Academic] Put forward a solution that will prompt further conversation and investigation.

Definitions of Research Direction

For future project development, information will need to be gathered and documented in the following areas:

> Current and developing ideas of what makes a good learning space.
>
> Latest educational technologies available.
>
> Exact programmatic requirements for Minnesota State Community and Technical College.
>
> Specific site conditions that will have to be designed for in this area.
>
> Current needs for MState's students and employees.

Plan for Design Methodology

The following five step design method will be used to guide the design process throughout the development of the project. Each idea will be put through this process to determine if it is successful or not:

> 1. Unifying Idea
>
> 2. Research Possible Solutions
>
> 3. Form New Idea
>
> 4. Test New Idea through Project Implementation
>
> 5. Evaluation of Implementation

Evaluation of implemented ideas will be based on qualitative and quantitative observations of graphic and digital analyses.

Plan for Documenting the Design Process

Design Mediums
A combination of analog design skills (hand sketching, hand modeling) and technical design software (AutoCAD, Revit, SketchUp) will be used for this project.

Deliverables
At the end of this thesis a complete project book will be produced, as well as a set of presentation boards, physical models, and an oral presentation.

Organization and Preservation
Software such as Adobe Illustrator and InDesign will be used for organizing and presenting the various parts of the project. Throughout the design process all work will be periodically backup up onto a physical hard drive and in the cloud. After the thesis has been completed it will be published online and a copy will be kept by North Dakota State University.

Specific Schedule for the Project

	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
Thesis Proposal Draft	▓	▓								
Thesis Proposal		▓	▓			▓	▓	▓		
Thesis Program			▓	▓	▓					
Design						▓	▓	▓	▓	
Thesis Exhibit									▓	
Thesis Reviews										▓
Thesis Book								▓	▓	▓

Important Dates

Thesis Proposal Due - OCT 11

Thesis Program Due - DEC 12

Mid Term Review Due - MAR 4-8

Final Thesis Review Due - APR 29-MAY 2
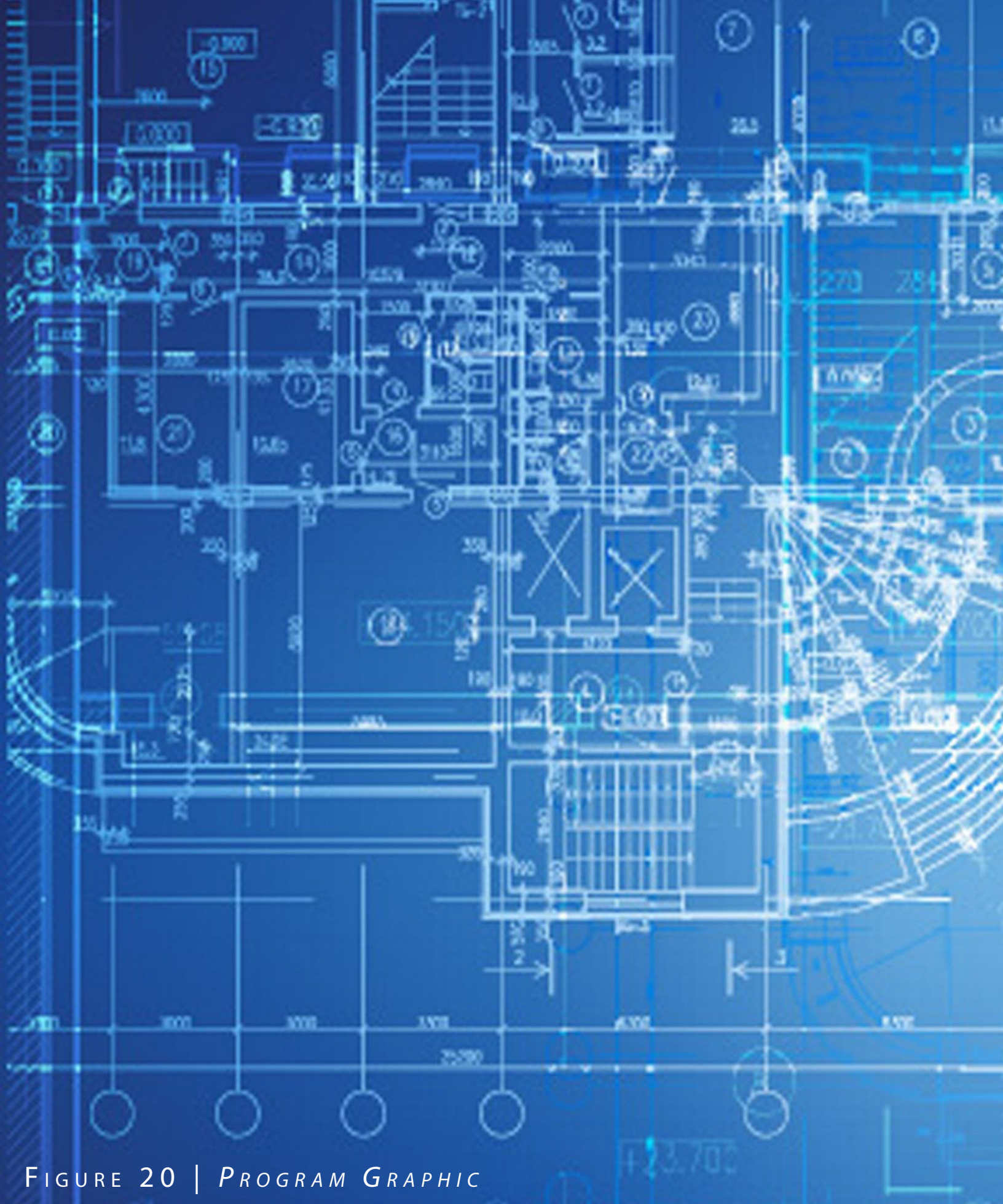
FIGURE 20 | *PROGRAM GRAPHIC*

THESIS PROGRAM

Flexible Learning, Paul Morgan

This article, written by Australian architect Paul Morgan, talks about the advantages of flexible learning spaces and the cites a few specific examples of successful flexible learning spaces.

Morgan opens the article by discussing the evolution of flexible learning spaces and the influence new technologies and teaching methods is having on universities in Australia. The concept of flexible learning spaces is something that I am striving to explore and include in my own project. Flexible learning spaces create places for students to experience and learn in more individual ways that benefit their specific tastes, as well as creates and environment that encourages multi-disciplinary interaction which is to the benefit of the student's learning experience.

The emerging design of non-traditional educational buildings that feature "think tank" open plan spaces supported by quiet individual spaces is something that Morgan talks about in the latter half of the article. This is very similar to the ideas I have for my own design for this thesis project, and seeing it here validates those ideas. They have been successfully employed in the three schools talked about in this article, mainly the Swanston Library on RMIT's campus in Melbourne, Australia.

Another idea that is heavily focused on throughout the article is the accessibility of information. Studies have shown that having accessible information through computer labs and other easily searchable information deposits creates a far superior environment for learning than traditional methods of having the teacher be the only source of information. This is reflected in the design of many classrooms where small tables that seat four to six students, or "cells", have been chosen over a more tradition speaker-and-audience setup commonly seen employed by many traditional schools. These cells encourage hands-on learning and student collaboration which has been shown to be a more effective method of learning. This type of design has been popular in schools that feature student science labs, and I have personally been party to their success in encouraging student conversations and learning.

The end of the article talks about the possible dangers of transitioning into such types of learning environments. Flexible teaching and learning spaces run the risk of becoming so flexible that they don't cater well to any learning requirement. There is a design balance that must be struck when dealing with these kinds of spaces that I should be mindful of when developing my own project. I'll need further research to determine what exactly defines this over-flexibility that leads to unusable spaces to avoid this in my own designs.

Tipping Points in Educational Design: Looking Forward, Looking Back

This article, written by Ben Cleveland from the University of Melbourne's Learning Environments Applied Research Network, explores the architectural design of learning institutions of the past and present and how they have changed over time.

The article begins by listing off a number of words relating to the concept of adaptability within and of built learning spaces. Adaptability and personalization have become major focus points in the field of educational design in recent years. Another core concept of educational design is technology integration, implementing new technologies to assist in the teaching of students, creating a more tailored learning experience for the individual. The article goes on to contrast these contemporary ideas with the antiquated ideas of past educational design that focused more on mass teaching with little to no emphasis on individuality or personalization, which modern research has proven to be an ineffective method of teaching students. This research has mostly been conducted on the Australian continent over the past couple decades with varying amounts of success, however one thing has been made clear through the results: learning is best done through an individualist approach.

Through my personal career as a student through various schools, I found myself in agreement with much of what this article has to say. The best schools I have attended have all been newer buildings that seemed to employ new technologies and individualist approaches (to the best of their abilities), so the article validates my personal experiences. The issue with these contemporary approaches to learning and teaching is that they require a much higher educational budget due to the increased amount of time and spaces needed for each individual student and the increased amount of technologies needed to be implemented inside and outside of classrooms. Educational budgets for public schools are already a large topic of debate in the United States, with many saying that schools are mostly under-funded without any reliable way to acquire more funds.

The article also briefly talks about the community benefits that come from a better teaching and learning environments. This was of particular interest to me because of the reasons I am using to justify my thesis project. Though the article didn't get very deep into the topic, it is doubtless that the quality of education that people receive highly impacts our communities and society. This highlights the critical importance of providing optimal learning facilities to students and teachers.

Overall, this article has only strengthened my points in arguing for better designed schools through the use of individualist teaching/learning methods and the further implementation of new teaching technologies in the school.

Literature Review Summary:

Both of the articles reviewed here focus on important aspects of educational design. Many of the ideas presented in these are relatively recent developments in the field of educational design, and they are ones that I plan on employing in my designs. The discussions had in these articles were very helpful and insightful in understanding the current trends in educational design.

PROJECT JUSTIFICATION

This thesis project and the topics that it covers are of great importance, not only to myself as a graduate student and upcoming architect, but to our society as a whole and the individuals it consists of.

According to recent studies and statistics, college attendance amongst young people has been steadily declining over the past several years. This presents a major issue for the future of our society. If people stop attending college to continue their education and earn degrees, we will inevitably see a rise in low-skilled workers for which there is already an increasing scarcity of jobs for in the United States, promising to only become scarcer with time. A decrease in college attendance will also lead to a less educated population as well as a narrower array of job skills and services available to the public by the public. Needless to say, these could become pressing issues for our society and economy as a whole, making it necessary to combat these trends.   However, to do so, it must be understood why these trends are being observed.

There are several factors which are contributing to the aforementioned trends, however there are a couple that stick out as the highest contributors: Lack of affordability and decreased returns on investment of time and money. The cost of college attendance has become exponentially more expensive since the mid-late 20th century and now most common people cannot afford the exorbitant amounts of money needed to attend college. Loans can be an option for potential students who cannot afford to pay out of pocket, however, these place an unhealthy and heavy financial burden on these students and their families which will linger for many years and even decades after graduation. The other issue, decreased returns on investments, means that students are increasingly not able to find jobs related to their majors after graduation, so the cost of going to college becomes greater than the benefits.

Now that the problems causing decreased college attendance have been determined, a solution can be attempted. These causes would most effectively be remedied though educational policy reform and/or government intervention, however, since these are slow processes, I would like to propose a more immediate solution. Through architectural design and programmatic reform, it could be possible to partially solve these issues.

MState boasts an extremely low tuition cap, a very successful program, and a high job placement rate. These are exactly what a college institution should strive to provide for its students, however MState's facilities are outdated and don't offer what many people would consider to be a proper "college experience". By designing a new facility for MState that can provide a proper "college experience" and better educational experience I hope to encourage its institutional practices and inspire similar practices to be implemented among other colleges and universities. Over time this could help bring back a healthy college attendance amongst young people as continuing education becomes an attractive post-high school option again.

As a student who has been attending college for the last five and a half years (one of those years being spent at MState) this project is important to me. I want people to be able to attend college and have the same learning and life experiences I was given the opportunity to have. I want them to be able to go out into the world and make a career for themselves that they will love as I will do. I want these things not just for their individual's sake, but for the sake of our society as whole. A society is made up of these individuals, and history shows that learned and well-adjusted individuals doing what they love makes for prosperous society.

As an architecture graduate student, this project provides me with an opportunity to display everything that I've learned throughout my years here in the NDSU architecture program and further prepare me for my personal career. It's my hope and intention that this project will also give me something noteworthy to include in my portfolio.

Historical

Education has been a part of societies all over the world for thousands of years with the intention of training the next generation of people to take over their respective fields. Colleges and universities are a slightly more recent evolution of past schooling systems. Today, higher education is almost a must of someone wants to do anything more with their life than work for minimum wage, however in recent times the cost going attending colleges has skyrocketed in relativity to the amount of money families make. Students used to be able to pay for their college tuition with a hard summer's work, but this is not the case anymore.

Education has also undergone many huge transformations and evolutions throughout history. Today, we see more technology than ever before being implemented in new classroom teaching methods, creating more diverse and personalized learning environments for students.

MState was established in Moorhead in 1965. Since then it has gone from being a simple trade school to being a full college, offering a wide variety degrees and transferable credits. Thought the cost of tuition has generally gone up throughout the years, MState has somehow managed to stay relatively affordable

Social and Cultural

In recent times it has become a trend for high schools to almost blindly encourage their students to go on to college after graduation. This naturally creates a large number of college applicants, which is generally a good thing. However, since the cost of college is rising to unattainable heights, less people have been applying for continuing education. This present an issue where people are becoming less educated and forced to work low-skill jobs when their talents may be better used elsewhere. There is also a stigma for people who choose not to attend college after high school, further encouraging students to enroll in a college they really can't afford. There is also a popular perception that the government should play a larger role in regulating the cost of colleges so that they can be made affordable for average people.

Qualitative Narrative

The project's site, at the corner of 20th street and I-94 in Moorhead, is overall a fairly unremarkable place. The lot is sizeable with much unused space left as wide-open grass fields, however these fields are planted with common domesticated grasses as opposed to the wild grasses typically found in this region of the world. The northern, eastern and western boundaries are planted with trees familiar to the area, such as maple and oak, forming a rather ineffective sound barrier against the bustling vehicular traffic routes to the east and south. The site will be somewhat noisy during times of peak vehicular travel, usually in the early morning around 7:00-9:00am and during the end of the workday/school-day around 4:00-5:00pm. In the north-western part of the site lies a small man-made pond with some natural greenery rowing around it. This may be the site's drainage area; however, it is difficult to be sure.

The site does not contain much for interesting or revealing views. The north and west views are of middle-income residential neighborhoods. The west view is rather unattractive, being that its of a small industrial area with beat fields beyond that (which can produce an unpleasant stench during the Fall harvest months). The south view only reveals the interstate and some cheaply constructed buildings on the other side of said interstate.

The weather in this area of the United States is often extreme in temperature. The summers can reach up to 100F and the winters can get as low as -30F. Moorhead receives a moderate amount of precipitation, this means that the site is usually covered in snow during the winter months and commonly gets several inches of rainfall during the warmer months of the year. During the winter months the Moorhead area sees little sunlight. During the rest of the year when the cloud cover is not as omnipresent the site will be flooded with sunlight due to the fact that there is no trees on the site, and there certainly aren't any hills or mountains to block the light either. This means that the site in the summer months will feel quite hot and during the winter months will experience harsh, uninterrupted winds from the north-west.

The site itself is not often traveled by pedestrians because of the lack of destinations on the site as well as the lack of walking paths going through the site. There is a bike path just across 20th street to the east which is frequently utilized by pedestrians during warmer days. The site receives many people coming and going entirely due to the presence of the college, with the small exception of the fire station on the north-east corner of the plot.

The site does not experience any observable distress likely because the site is barren of almost any features and has been completely deveoloped.

Yearly Temperatures (HIGH/LOW) in Fahrenheit

JAN	18	0
FEB	24	5
MAR	36	19
APR	56	33
MAY	69	46
JUN	77	56
JUL	82	61
AUG	81	59
SEP	71	49
OCT	56	35
NOV	37	21
DEC	22	6

Yearly Precipitation in Inches

JAN	0.75
FEB	0.59
MAR	1.34
APR	1.57
MAY	3.15
JUN	4.13
JUL	3.23
AUG	2.68
SEP	2.95
OCT	2.60
NOV	1.14
DEC	0.87

Average Sunny Days (SUNNY/PARTLY CLOUDY/CLOUDY)

JAN	6.7	7.5	16.8
FEB	6.3	7.2	14.8
MAR	5.5	9.0	16.6
APR	6.6	8.8	14.6
MAY	7.0	9.8	14.2
JUN	6.4	10.9	12.6
JUL	10.1	13.4	7.5
AUG	10.4	11.9	8.7
SEP	8.7	9.2	12.1
OCT	8.7	8.3	14.0
NOV	5.5	6.3	18.2
DEC	6.1	7.3	17.5

FIGURE 21 | SITE MAP

PERFORMANCE CRITERIA

The following is a list of various performance criteria for the thesis project to measure and analyze. It has been split into two sections: Primary criteria, which are the most closely related to the aims and goals of the project and therefore important to the project's success, and secondary criteria, which, while still important to general architectural design, do not play as large a role in this specific project's success.

Space Allocation [Primary]: Space allocation is the first of the three performance criteria of primary concern for this thesis project. The spaces in the design will be measured in square footage in terms of useable and useful area and volume. The sources for measuring this will primarily be the floor plans that will be produced during the design on the project, but digital and even physical models could be secondary sources for measurement. After measurements have been established from these sources it will be analyzed to determined whether the spatial allocations have been optimally designed.

Behavioral Performance [Primary]: This is the second of the three performance criteria of primary concern for this thesis project. Usage patterns by the students and faculty will play an important role in determining the successfulness of the design. These can be analyzed through modern computer applications meant to predict usage habits, as well as surveying fellow students about their perceived predicted usage. After enough information has been gathered about the predicted habits an analysis will be done to determine the success or lack thereof of the design.

Psychological Performance [Primary]: Finally, psychological performance is the last of the three performance criteria of primary concern. This aspect will focus on creating a space that is appealing for learning and teaching. This performance will be the most difficult to measure, however it can be done efficiently by collecting data on effective teaching and learning methods and comparing them to my own designs. Ideally all of these methods would have already been implemented by the time the analysis is attempted.

Energy Consumption: Energy consumption can be measured through the use of computer applications by predicting the energy required to run the day-to-day operations of the building. Once determined, this information can be used to compare the design to similarly sized and typed buildings. Success will be measured by its relative performance.

Environmental Impact: Environmental Impact will likely be minimal due to the nature of the building and its site; however, it is something that will be compared to the currently existing building. The goal of this project's environmental performance is to meet or exceed the lack of impact done by the current building. This will be measured by looking at factors such as emissions, drainage, and materials.

Code Compliance: This thesis project will comply with all international building codes as well as ADA guidelines. These can easily be measured by comparing the final design to the various code books, both online and physical copies. If the project meets all code requirements, then it will be regarded as successful on this front.

Cost: A budget can be approximated by looking at MState's yearly budget, as allowed by the MNSCU (Minnesota State Colleges and Universities) system. After the design, the cost of the project can also be approximated by taking advantage of computer applications able to estimate such things. After the estimation has been completed it will be compared the budget determined for the project. If the project comes in under budget, it will be considered successful.

Executive Summary

The performance criteria listed above represent key aspects of the project that will have to be measured and analyzed both during the development and at the end of the project's design. Doing so will help objectively determine the overall successfulness of the design, which is important in answering the question of how our higher educational systems and institutions can be better designed for the future, as well as addressing the issues mentioned in the previous parts of the thesis proposal and program. With the exception of the three primary performance criteria that have been set aside from the others, these criteria are not meant to be driving forces behind the development of the project, but merely things that should be kept in mind while designing to create a solution that not only responds to the thesis topics, but also creates a sufficient and satisfactory architectural solution. It should also be noted that this list is not exhaustive, and further points of interest may be measured and analyzed in the future of the project's development.

Tentative Spatial Allocation Table

Class Rooms	21%	42,000 ft
Lecture Halls	9%	18,000 ft
Faculty Offices	6%	12,000 ft
Administration	4%	8,000 ft
Restrooms	3%	6,000 ft
Maker Spaces	11%	22,000 ft
Collaborative Spaces	9%	18,000 ft
Library	5%	10,000 ft
Dormitories	10%	20,000 ft
Cafeterias	4%	8,000 ft
Exercise Area	2%	4,000 ft
Commons	6%	12,000 ft
Book/Grocery Store	5%	10,000 ft
Mechanical	2%	4,000 ft
Other	1%	2,000 ft
TOTAL	**100%**	**200,000 ft**

Tentative Space Allocation Web Diagram
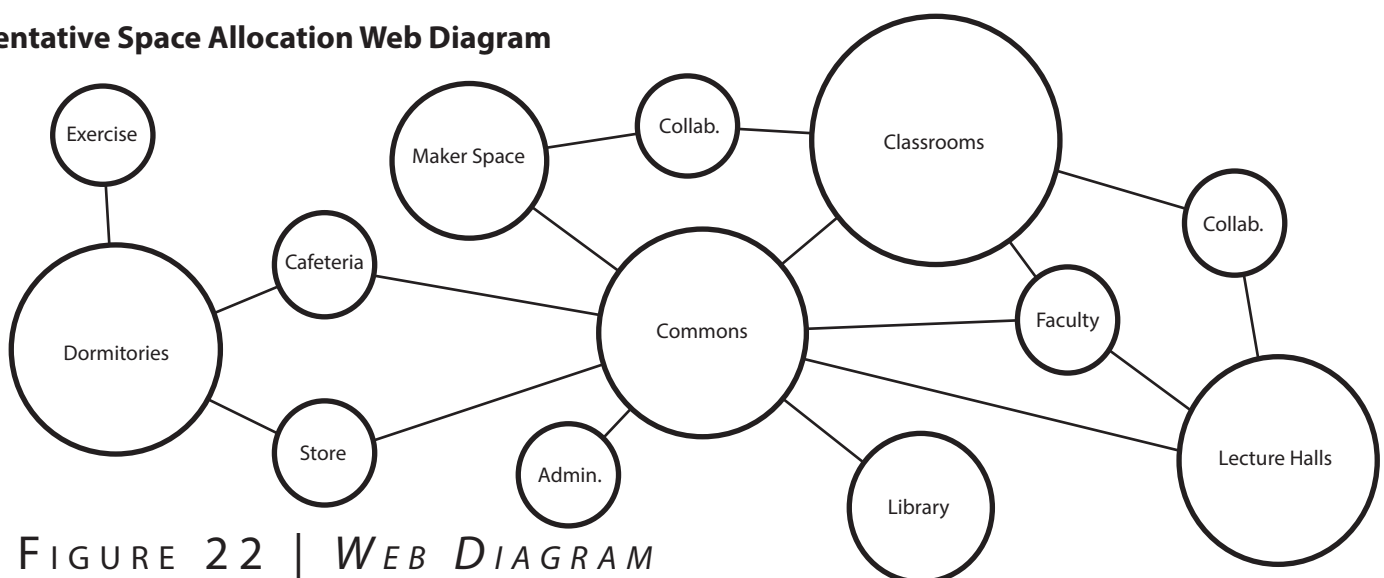
F I G U R E 22 | *W E B D I A G R A M*

DESIGN

I frequently find myself starting with the form when it comes to design, and it was no different for this project. While investigating the form and creating multiple iterations I simultaneously thought about materials and site. Here area a few of those forms and the materials I decided on using for the project.
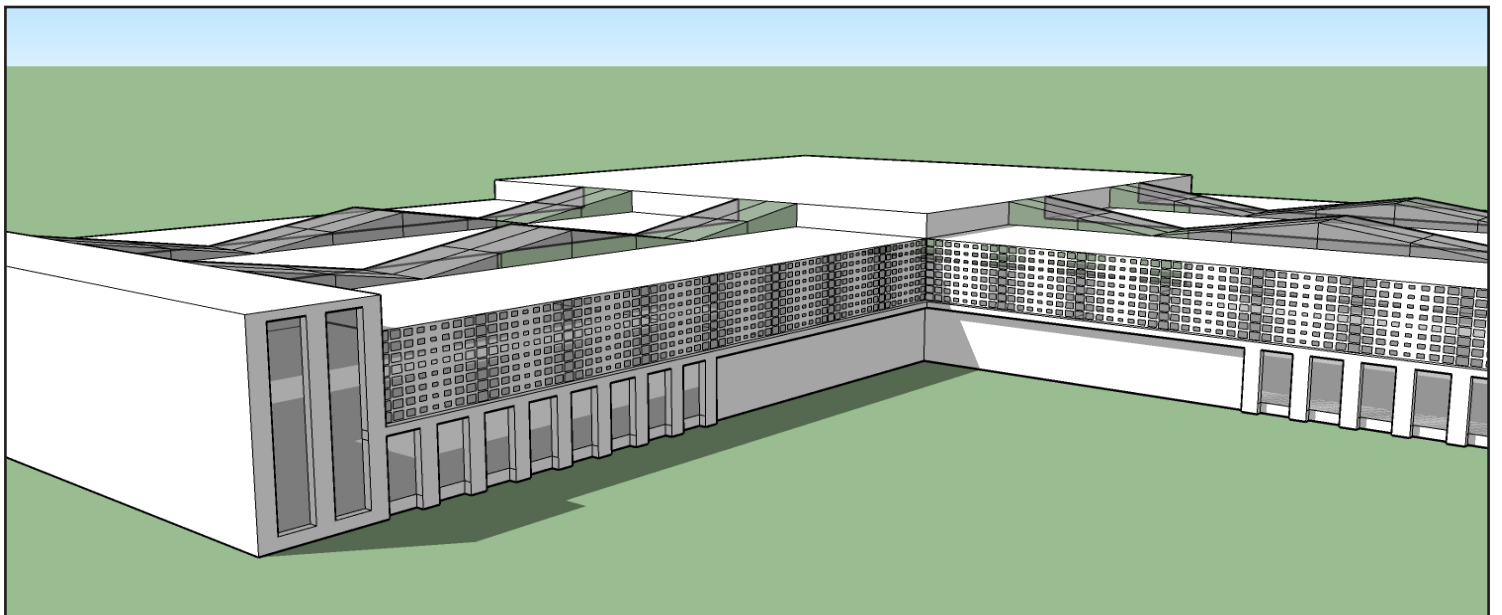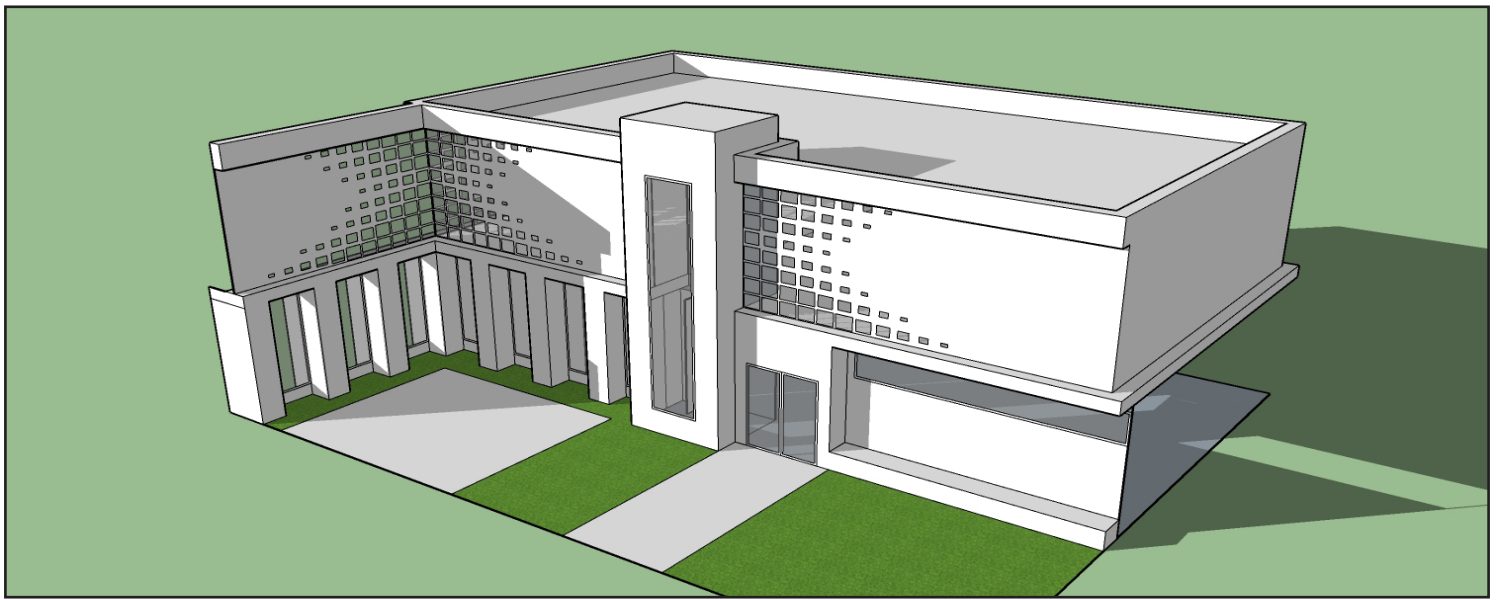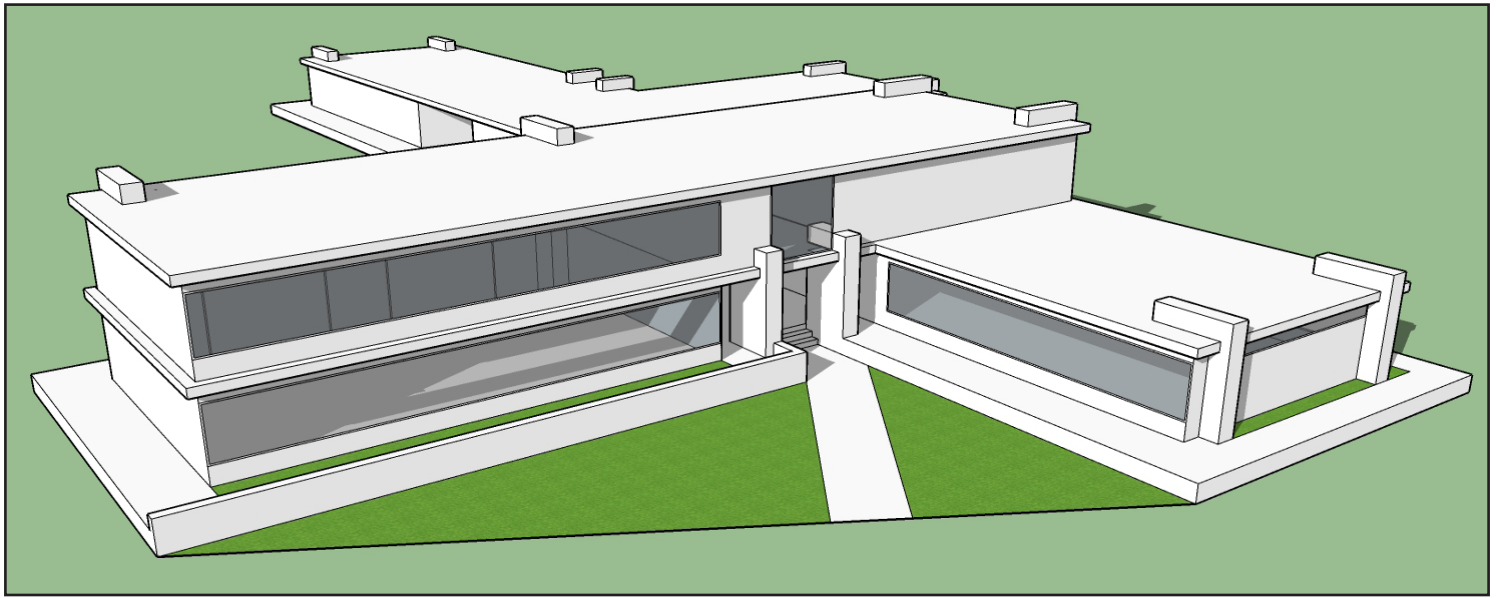
After recieving some extremely helpful criticisms during our mid-semester critiques, I decided to take another look at my project and attempt to address some of the issues with my current design that I presented. Below are some images that were shwon at midcrits.
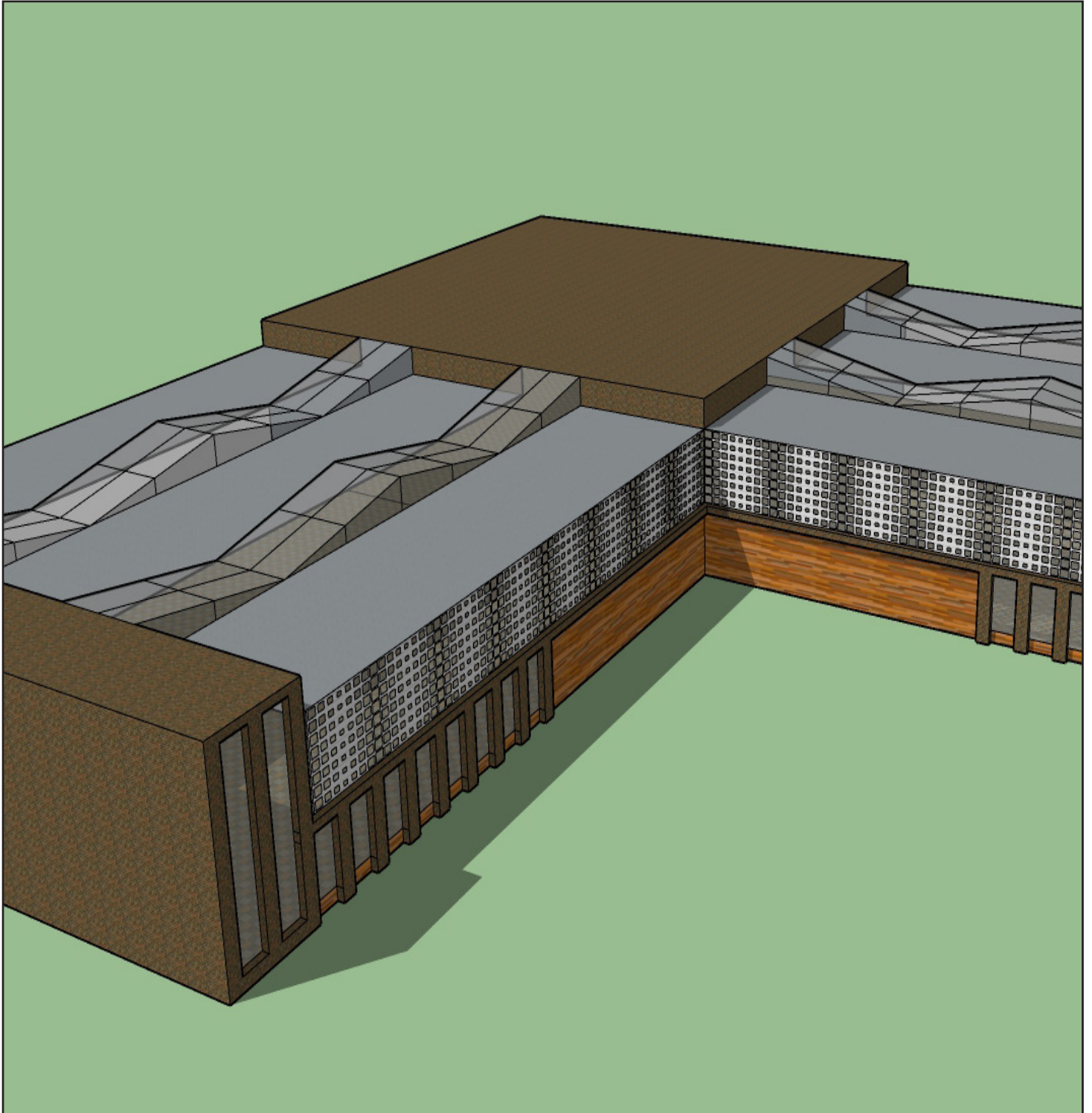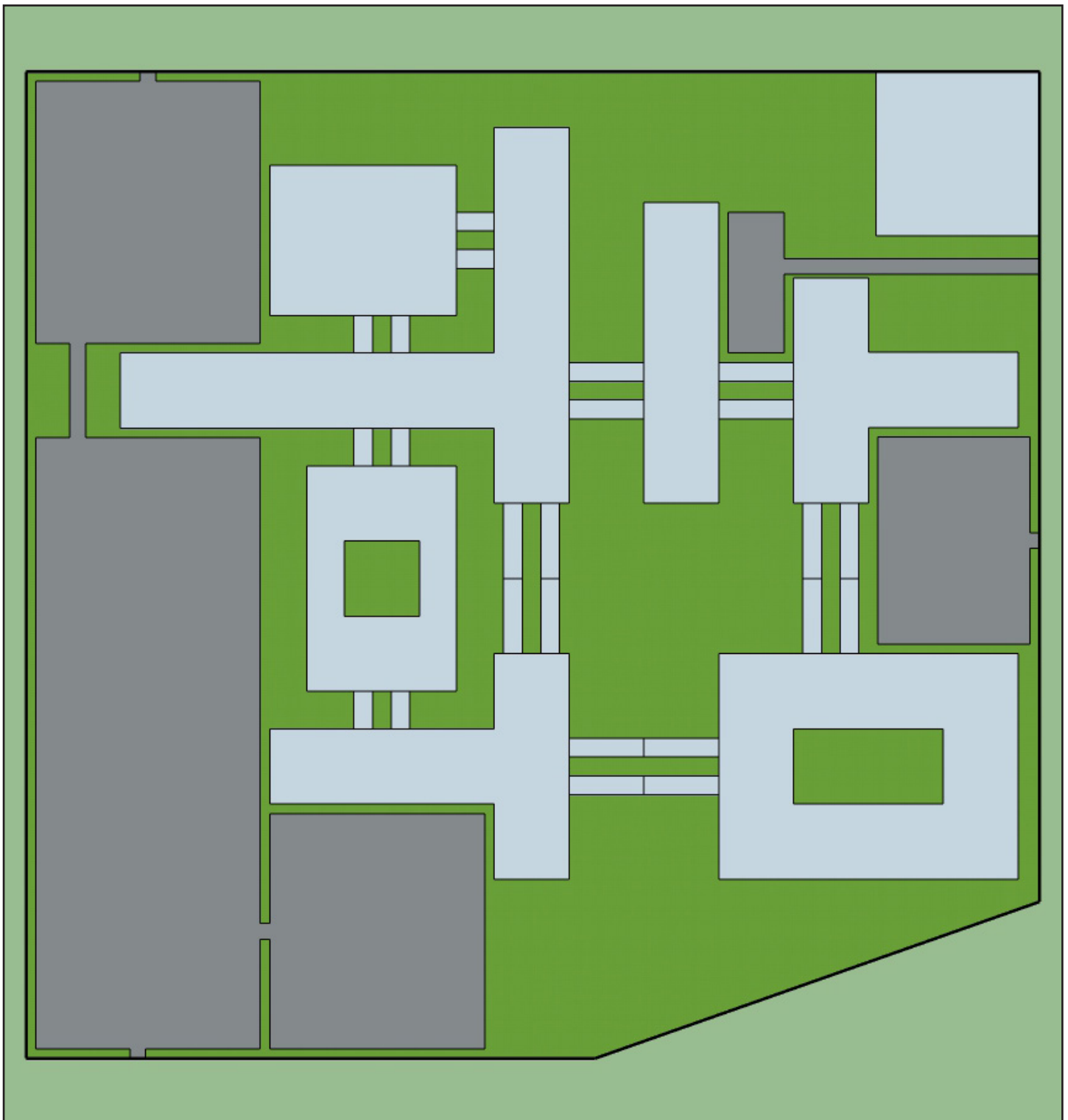
I tried designing the campus on a grid layout to help with spatail allocation, however in practice, this only served to divide the campus and make the green spaces less appealing.
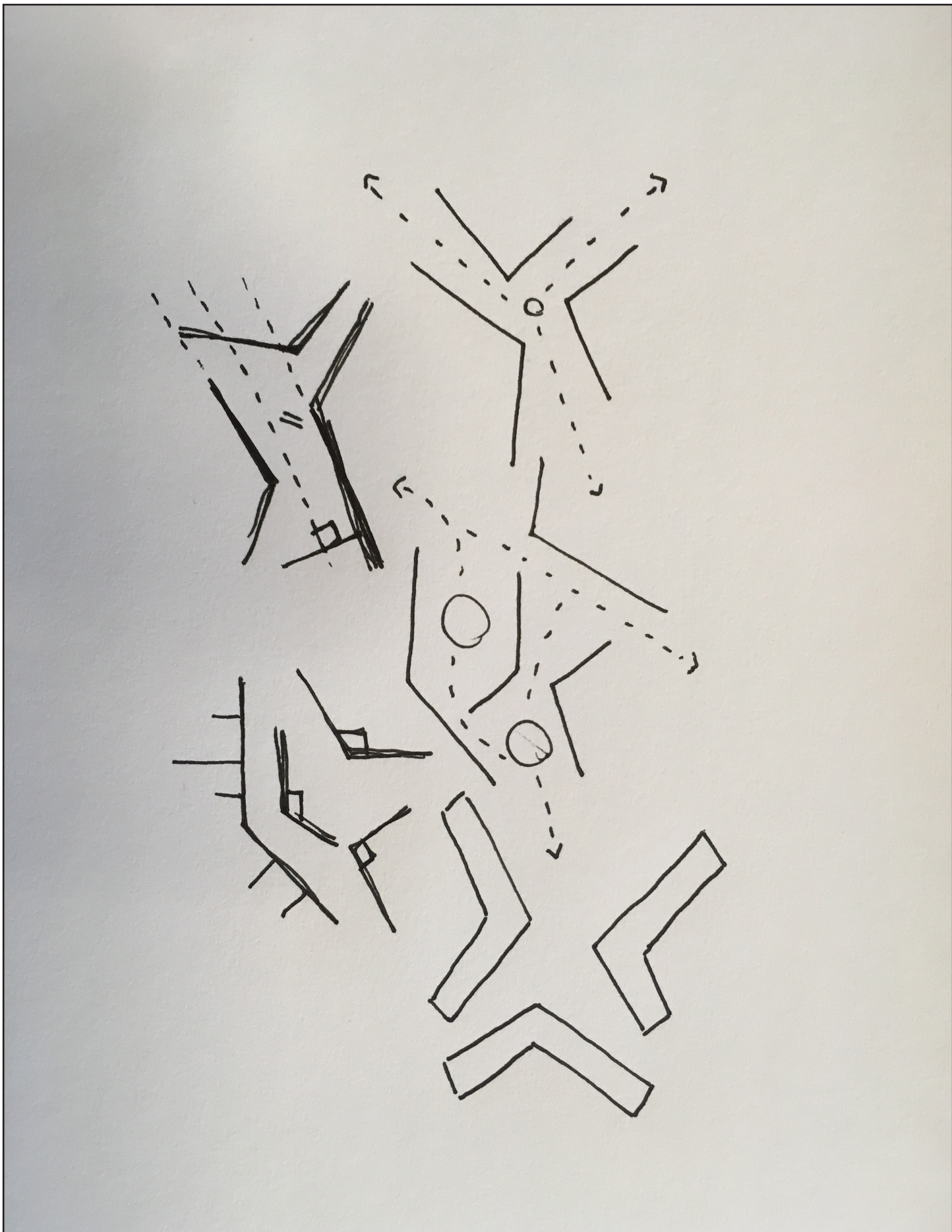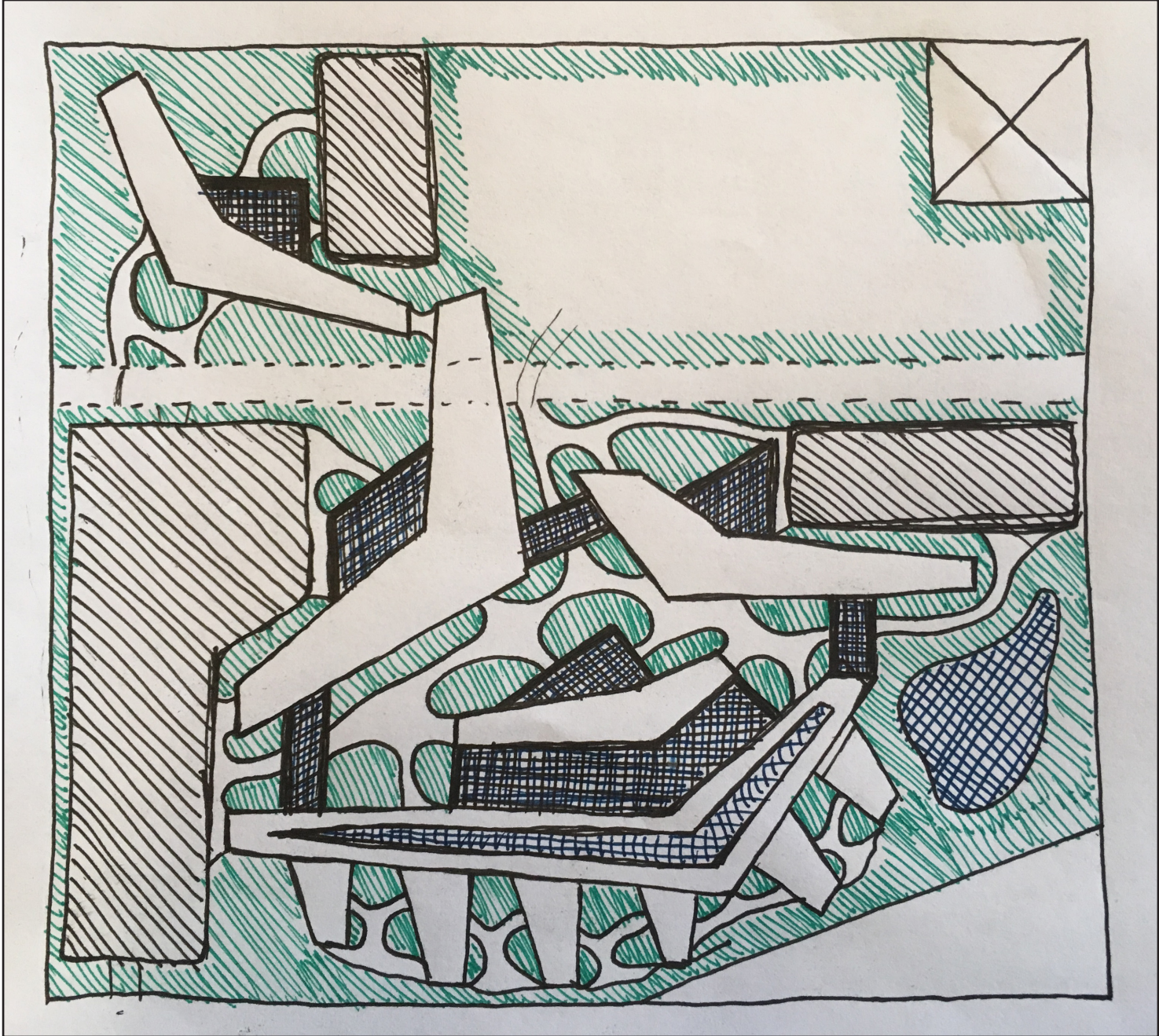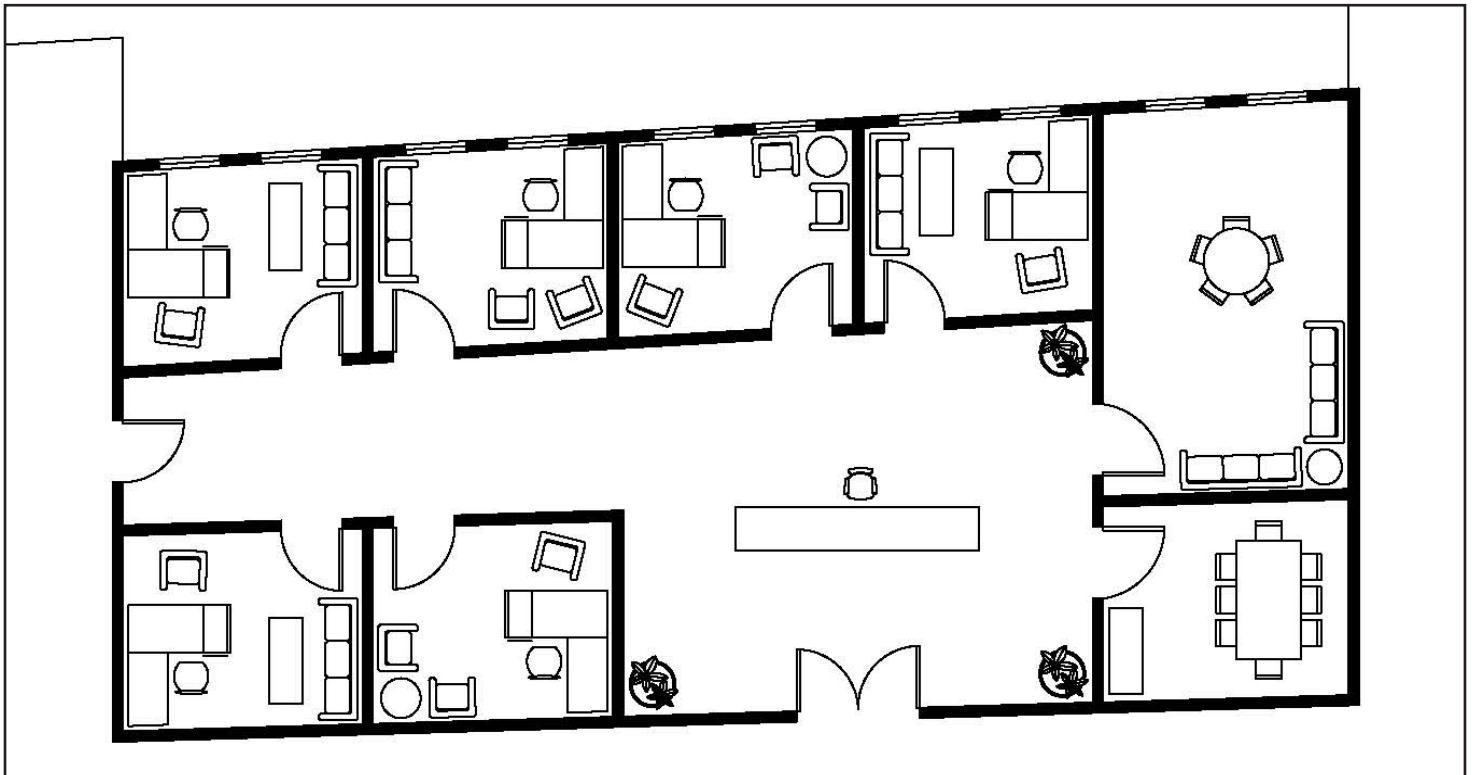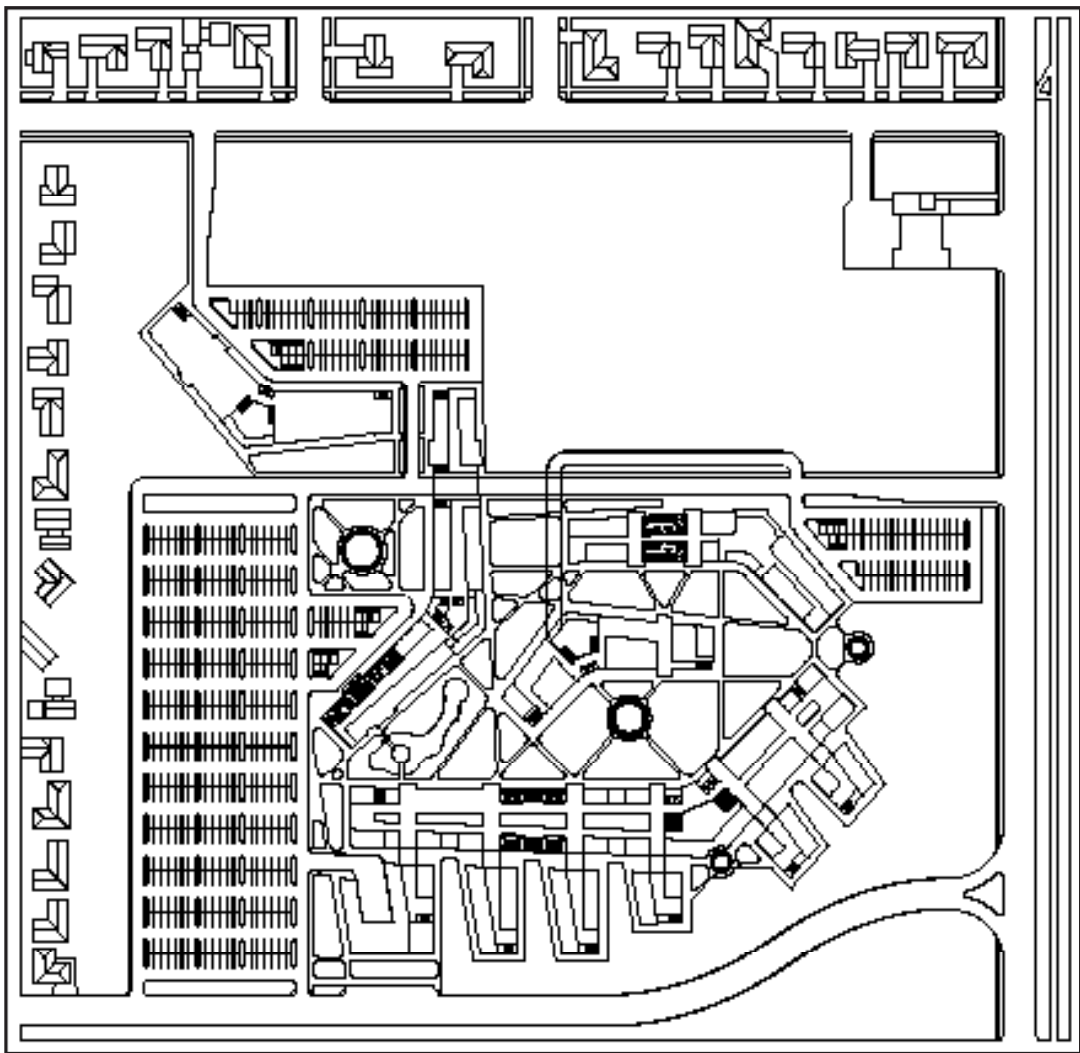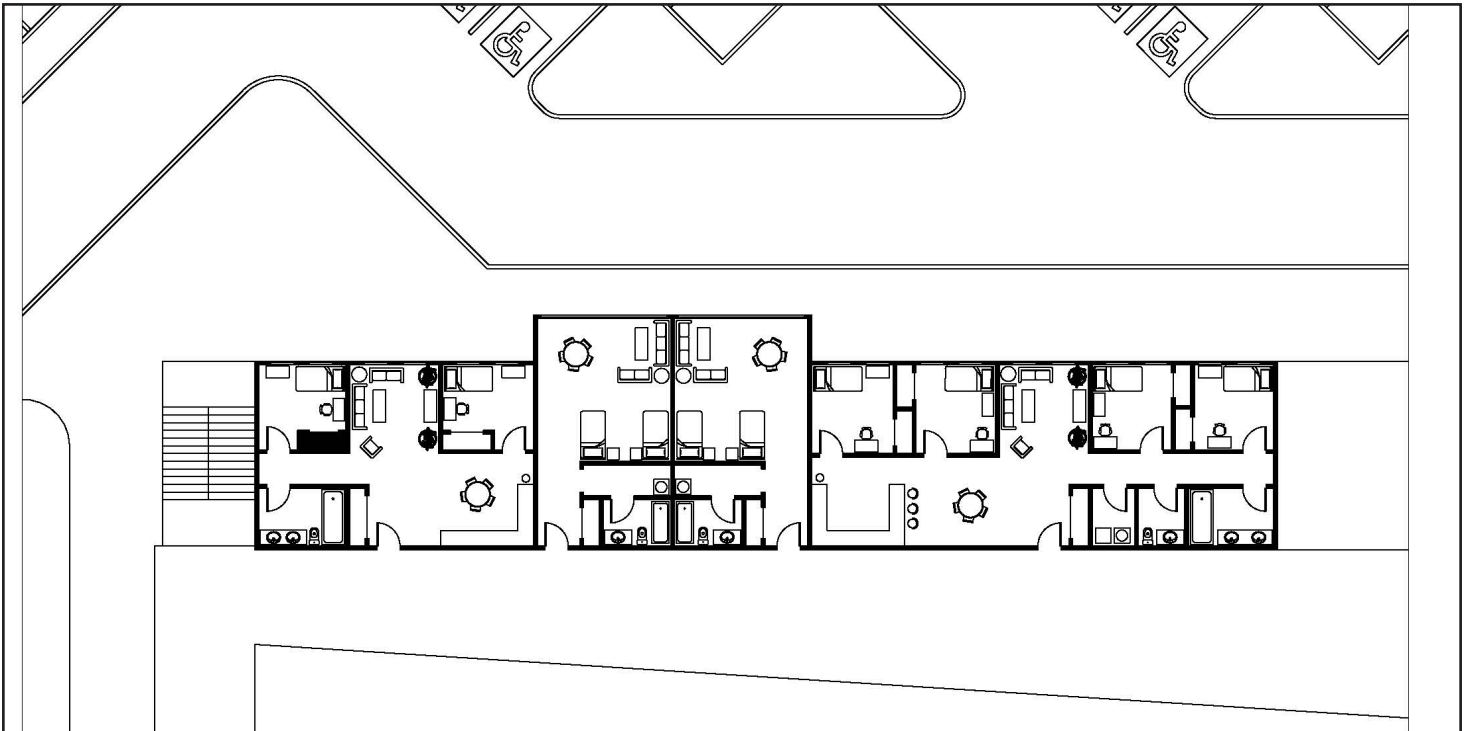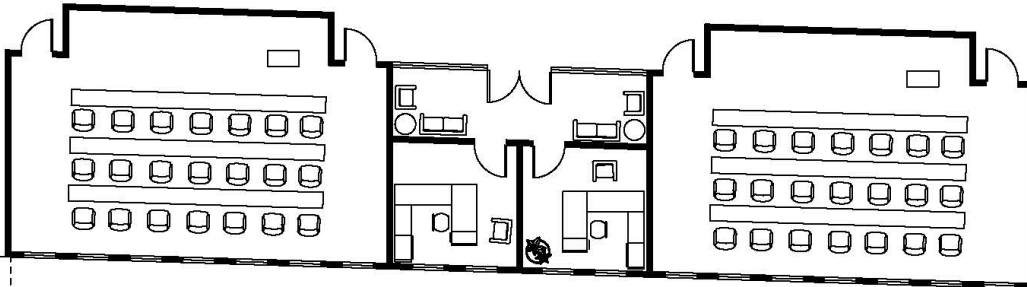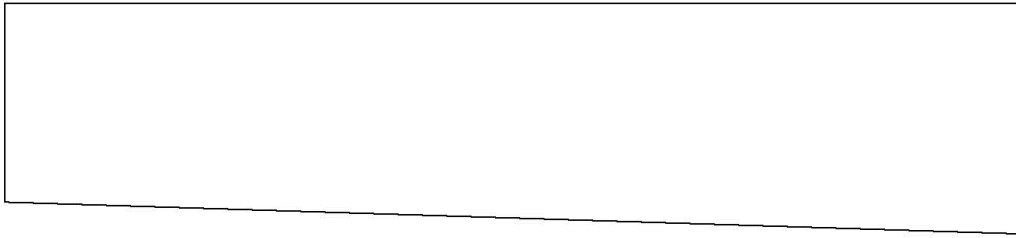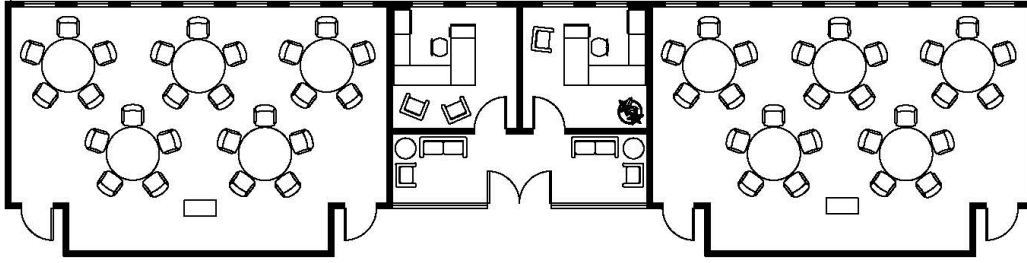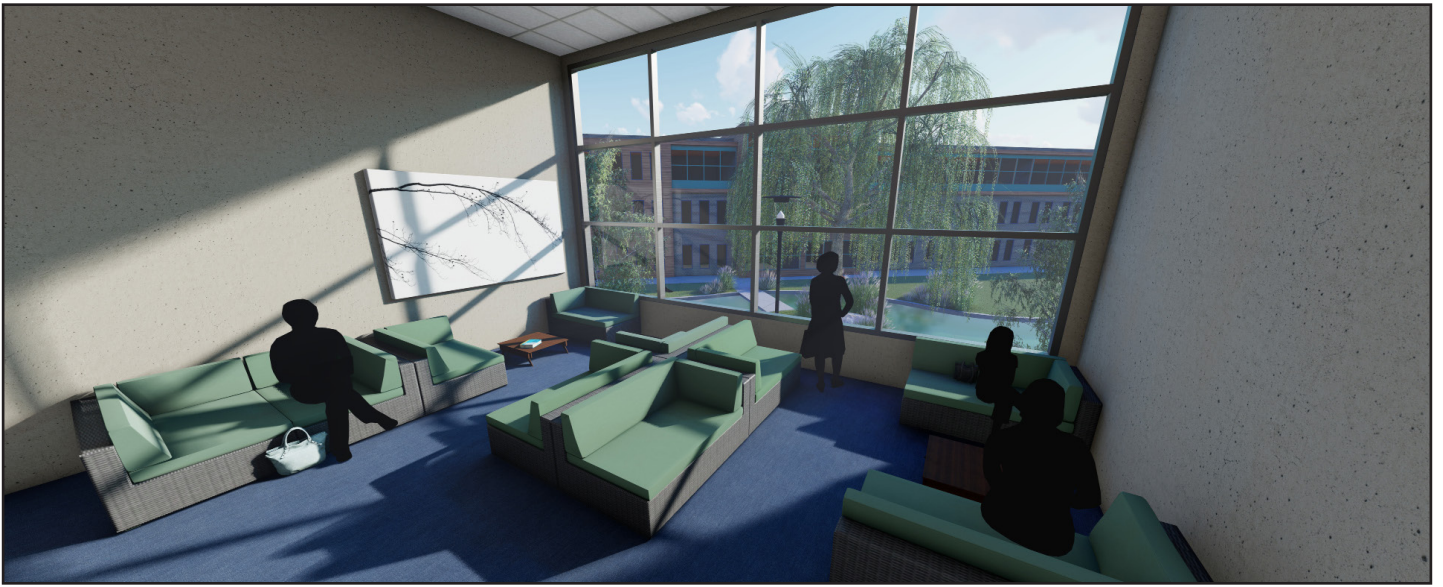
MSCTC REDESIGN
Bringing Higher Education into the 21st Century

Colleges and universities are uniquely important to our society as they harbor and cultivate the minds of future generations of leaders. It's extremely important for these spaces to cater to creativity, learning, and open dialogue as this is how people improve upon their mental and professional skills. However, the models currently being employed for these facilities and campuses are often inadequate and have become outdated, no longer properly suited to their purposes as we know them now. This next generation of leaders is therefore not reaching its maximum potential so countless innovative and new ideas could fail to come to fruition because of these ill-suited environments.

Featuring shared study spaces, natural lighting, outdoor connections, and emphasis on spatial flexibility, this thesis project provides an alternative model to the current academic facilities that we have in our higher education system. Through improving the design of our educational facilities like this, we may be able to secure a better future, not only for the students occupying and studying at these facilities, but for everyone in our society that benefits from the thoughts and ideas that are produced there.

Steel Structural System Grid
Steel columns hidden in wall assembly support the vertical loads of steel beams.

District Energy System
Main mechanical stored under Student Union building accessible through underground service road.

24th Avenue South
Public Park
28th Avenue South
Exit to I-94

A	Education Building	E	Art Wing	I	Administration Building
B	Automachinery Wing	F	Culinary Wing	J	Student Residence Building
C	Healthcare Wing	G	Technology Wing	K	Library
D	Science Wing	H	Student Union Building	L	Moorhead Fire Station

1	Classrooms	5	Student Lounge
2	Lecture Halls	6	Bookstore
3	Faculty Offices	7	Gym
4	Flexible Study Spaces	8	Locker Rooms

9	Administrative Offices
10	Student Apartments
11	Restrooms

MSCTC REDESIGN - Bringing Higher Education into the 21st Century
ARCH 772 Design Thesis
James S Jaeger
Cindy Urness
Programs Used: AutoCAD, Revit, SketchUp, Lumion V, Illustrator, Photoshop

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FIGURE 23 | *NDSU EXTERIOR*

Previous Design Studio Experience

2nd Year – Fall Semester: Daryl Booker
Tea House | Moorhead, MN

2nd Year – Spring Semester: Joan Vorderbruggen
Pritzker Architect Birdhouse | Fargo, ND
Montessori School | Fargo, ND
Small Dwelling | Marfa, TX

3rd Year – Fall Semester: Mike Christensen
Floating House | Winona, MN
Museum Renovation | Winona, MN

3rd Year – Spring Semester: Regin Schwaen
Steel Museum | Fargo, ND
Concrete House | Moorhead, MN

4th Year – Fall Semester: Bakr Aly Ahmed
High Rise - Integrated Design Studio | San Francisco, CA

4th Year – Spring Semester: Paul Gleye
Urban Design Project – Study Abroad | Brussels, Belgium

5th Year – Fall Semester: Mark Barnhouse
Wetlands Research Center | Ulen, MN

Personal Identification - James Scott Jaeger

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Phone: (701) 566-1881

Email: jamesjaeger1996@gmail.com

Hometown: Moorhead, MN

"NDSU has provided me with invaluable architectural experience and knowledge that I look forward to taking with me into the field."