The Gene Haynes Addition

Omaha North High School Civil Engineering and Architecture Class

An addition to Omaha North High School to

expand the Science and Engineering departments

because of the growing number of students.

Instructor
Dr. Lee Kallstrom

Mentors

Nick Schulz - The DLR Group

Jeff Patry - Schemmer and Associates

12th Grade

Steve Timko

11th Grade

Jarod Clark Chelsea Dukes Ken Gantz Sam Irvin Gabriel Langdon
Jaime Lopez
John Nesbit David Repair Calvin Saunders Geoff Vlcek

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Omaha North High School S.A.M.E. Crew 2004-2005

Problem Statement

As Omaha's population grows, so does the number of attending students at North High School. Also the engineering program is expanding and growing at North High. This means more classes and programs for students to take. At North the work space is limited for the engineering department. Some projects are relegated to be conducted in a storage room in the basement of the school. The national affiliates with Project Lead the Way have expanded classroom needs at 350 students by the 2006-07 school year. This lack of space brought us to the question of how to create more for work space and lectures.

The Journey

This project will be similar to a recent addition termed "The Viking Center". We named the addition, "The Gene Haynes Addition," in honor of our current principal who is overseeing the project. North was originally shaped like an "E". The Viking Center filled in the open, courtyard-like area in between the middle and north sections. This new addition will be going in between the middle and south sections.

When our teacher, Dr. Lee Kallstrom, said that Mr. Haynes wanted ideas about this expansion, and first told us about this project, it didn't seem like it would be that difficult. But we quickly realized that it would be a challenge.

At first, we brainstormed and assigned everyone jobs to do. This included different parts of the paper, models, drawings, etc. We worked on these mini projects for a while until each section had a rough idea what they were doing.

Before we could draft any floor plans, we had to consult with the teachers who would occupy the added space. After many interviews, the teachers and the people in charge of designing the floor plans met in compromise and reached an agreement.

We first met our mentors, Mr. Nick Schulz and Mr. Jeff Patry, when we showed a powerpoint presentation to them with each section represented. They both said that it was a good start, but it had a lot of room for improvement. They then began working with small groups individually to fine-tune their sections.

We spent the next few weeks revising, redoing, and rewriting our respective sections. After completing them to the mentors' and Dr. Kallstrom's expectations, we began writing our summaries. It took each person many drafts and revisions, but what we ended up with was a very good paper.

After that stage, we began drawing sketches, making models and taking pictures. Each person on our team was supposed to make at least four sketches showing something about his/her part of the project. Many pictures were taken to explain and realize the project. Some photos were the existing area and parking lot, local buildings and structures with features similar to what we will be doing, and team members as well as other people involved in this project.

At the same time, we had a group making a three-dimensional model of the addition out of the museum board. A small model was created that featured the existing building's attributes, whose purpose was light study. A larger model was also made that shows the finished addition. In addition to the 3D model, one of our team members created a 3D Revit drawing which allows us to have a fly through of the building on the computer.

Everyone was involved in the final submittal paper. Each member has written a section of it pertaining to his/her areas of the design, some had to create other necessary parts of the paper and one student and multiple teachers were in charge of the editing process.

The Site

The Gene Haynes Addition location has been in question for years. Since this project was thought of they have been thinking of a place to build it. Some thought that an off campus building would provide enough space for the building. We thought of a few different locations for this project and we came up with a site across from North High on the north side of Ames Avenue on 36th Street. We didn't use this location because the cost of the lot and building cost was going to be too expensive.

After that idea became unlikely it was suggested that we use an area on our building that isn't being used. Those immediately made us think of our Viking Center. The Viking Center was made from North High's old courtyard that was turned into a Lunch Room. That old courtyard was the same size and area as a similar parking space located on the southwest side of the building. It was decided that this would be the perfect place to design and build the Gene Haynes Addition. It was decided that

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The location of the proposed addition is in between two existing walls; because of that we had a few restrictions. Stained glass windows on the south wall in the library could not be covered and light could not be cut off from the windows. Also, there are bathrooms that we have to build around in the center of the east wall.

Interviews

I interviewed Mr. Dappen and Mr. Walter, our physics teachers, and Mrs. Vaughan, our physics and biotechnology teacher, to find out what special needs they would require to effectively teach their classes. I have also developed a Gantt chart, as part of my assignment showing the activities and timelines for completion of the new addition. The interviews are now done, but the Gantt chart is an ongoing process.

Mr. Dappen and Mr. Walter will have the two rooms on the southern end of the building on the second level as their physics classrooms. The classrooms are identical, each having a divider; on one side of each divider there will be a classroom with basic classroom needs (desks for the students, desk for the teacher, etc.), and the other side of each divider will be a lab featuring the following: six lab tables, each with AC/DC electrical outlets; a demo table for the teacher, a heavy metal bar similar to what the teachers have in science rooms on the second floor (look in Room 241 on the ceiling in front of the classroom).

Mrs. Vaughan, who is both a biotech and physics teacher here at North, has the two remaining classrooms on the north side on the second level. One of her rooms will be a classroom with desks (with foldable desktops) for the students, a desk for the teacher, and a capacity of 30 people. The second classroom will be a lab, featuring: four lab tables (there will be specific measurements on them), each with both electrical and networking capability; one or two sinks, assorted counters and cabinets to put lab material in, a desk for the teacher, a cabinet in the back that can hold laptop computers; a ceiling projector centered in the middle of the four lab tables and in a certain direction; a projector screen, and a small cubicle for students' backpacks, along with other materials. There will be a "mudroom," which features a refrigerator, freezer, ice maker, incubation shaker, and assorted counters and cabinets; this room will be on the western side of the second level, near the lab room. Glass cases will be placed outside the classrooms to show work of students, schedules for meetings, etc, and they are to be used by all three teachers. Products made by Mrs.

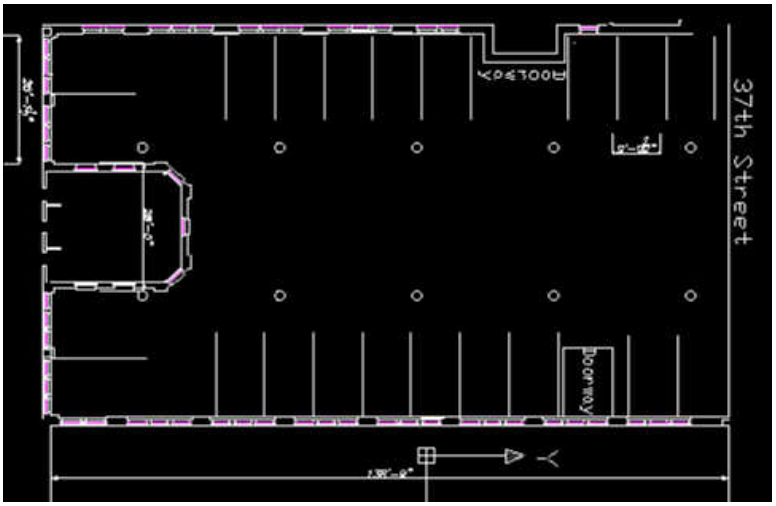
Vaughan's classes will be sold at a concession stand, or storefront, adjacent to one of her biotech rooms. There will also be a solarium that will be used to provide an environment for plants grown by her classes. This room will either be on the western side of the second level, next to the conference room or up on the roof (where it can get a full sunblast).

The Gantt chart, which is a continuous process, presents tasks for the project and gives the undivided responsibility for those tasks. It also shows the dates and timelines at which the tasks were entered and finished and the duration for those tasks. While the tasks and each person responsible for them are recorded, the dates are still being evaluated.

Parking Lot

The site of the new addition is located on the west side of the building on 37th Street, north of the library. The free standing addition will be built over the existing parking lot. This structure addition will be consistent with the structure of the original building.

A few things about the existing lot will be changed. The first level of the new addition will remain a parking garage. The parking lot has several choices in the design of the exterior façade will have a different design and the garage will no longer have 17 spaces. Access to the parking lot will still be from 37th Street.



Piers and other structures will be needed to support the other stories of the new addition. This will require a few changes in the parking stalls and reconfiguring a new parking arrangement. There will be perpendicular parking on both sides of the parking lot as there is now. The grassy area will be removed to expand the space on the north side. In addition, parallel parking spaces will be provided in the middle of the parking lot. There will also be a space to park in one of the indentations of the building. The interior design will be finalized when the location of the piers are specified.

The entrance will be landscaped regardless of the new design. The plan is to have plants and other shrubbery to the north of the entrance. This will add elegance and improve the appearance from 37th Street.

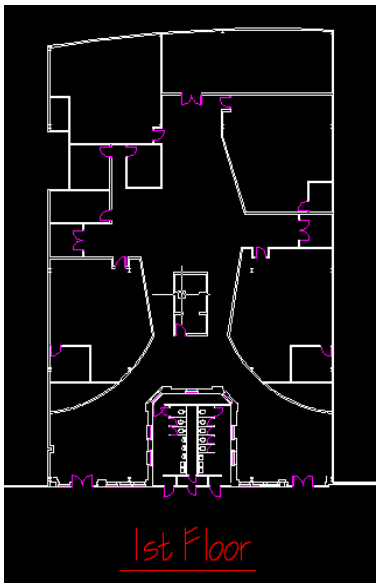
One design alternative provides a security gate with a retractable gate. This will allow only authorized personnel to enter the lot.

There are three options for the parking lot's exterior design. One option is using shrubbery to close in the parking lot from 37th Street. The entrance will have a large Viking ship emblem on it to add spirit. There will be also groupings of flowers and other plants planted annually with shrubbery.

Another option is to have cylinder block to close the wall in from 37th Street. There will also be small groups of plants and flowers. This will also have shrubbery. The entrance will also be arched and will have Viking helmets for the light covers on the outside.

The last design consists of bricks surround the outside of the parking lot from 37th Street. One of the big differences that this has from the other options is that the light poles will have Viking helmets if possible. The entrance will be arched and will have a Viking ship emblem on it.

First Level



The first level of our addition will be our engineering floor. This features four classrooms, a conference room, office space for six staff, two restrooms, a display area near the entrance to show off students work and products, and one storage closet. The first floor walls have been designed to pull you into the center of the building. The addition will be adjacent to the existing building and will be able to be accessed from the first floor of the existing building.

The conference room, which is will be located in the northwest corner of the addition will be used for team meetings and discussions with mentors or other guests.

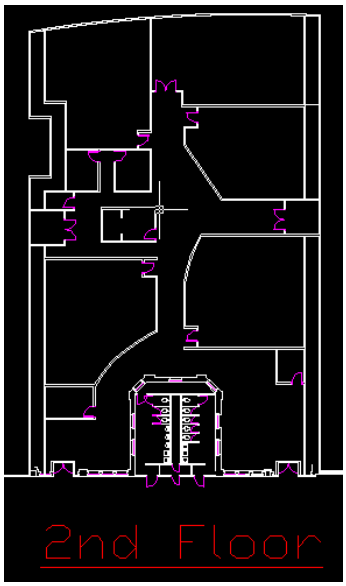
At the east end the entryways are located on either side of the existing bathroom. Along both entry areas, there is display cases designed to show off student work to all visitors.

Four classrooms will complete this level. Two of the rooms will be used for lecture/workshop classes. The remaining two classrooms will be used for computer workshops for using CAD and other computer drafting programs. An area for teacher's offices will be located centrally in the main

hallway. The egress will be a stairwell, located on the north and south side of the building.

The west wall will be constructed completely of glass. It will provide natural lighting aspects along being an aesthetically pleasing façade to the building. The wall will also have a slight curve to show style and uniqueness and give off a modernized visual sensation.

Second Floor



The second level of the new addition to North high will be a new facility for Physics and Biotechnology. Classrooms will include specialized equipment needed for the various science classes. We interviewed North science teachers for suggestions on the design layout. Ms. Vaughn requested a "Mudroom" which will include an Incubation shaker, ice maker, freezer, and refrigerator. In the biotech she wants 4 lab tables at 30" and 84"x 64". For each classroom she wants dry erase boards with bulletin boards on either side also.

The center of the addition is going to be ten office spaces in the form of cubicles which will be located in between the classrooms. Each cubicle will be two feet deep and five and a half feet wide. . Also there is a bathroom for staff included in the center of the office space.

There will be four classrooms located on either side of the addition. Two of the classrooms will be used for the use of Biotechnology and the other two for Physics classes. The classrooms will be 39x31 feet (1209 sq ft.) and will include lab tables with computers for labs.

At the far west end of the edition there will be a Lecture Hall/Conference area. This will include tables probably 4'x8' for teacher/student meetings. This whole area is 49'x`18' and is on the far west side facing 37th street.

The second floor will be reduced 4' on the north and south sides with light channels to the first floor for natural lighting. It will stretch from the east to the west walls 136'. It will all be open from the second to first floors and guarded by railings.

Overhead Lighting

Natural lighting will provide most of the lighting for the building addition during daylight hours. Overhead light will supply increase the illumination classroom and office.

Our choice for overhead lighting is the finelite series 12. This product offers a modern look with the lighting capabilities appropriate for school and classroom environments. It offers indirect lighting for the classroom, and also has uplight controls that can shield light when needed. For example the uplight control will help with audio and visual presentations, the controls allow one bulb to produce a little light upwards and the other two basically shut off. An additional fact about the series 12 is that it uses a T5 bulb. The T5 bulb is both state-of-the art and economical.

The series 12 also would allow for long parallel strips in each of the rooms. By simply connecting the two end power connecters a 4 foot light turns into an 8 foot one. Our design includes two long strips between the lengths of 12- 20 feet in the classrooms. The special shields in the lower half of the semi moon shaped lights allow some light to go directly downward.

Conference rooms will have about a 16 foot light strip running through the center of the room. Pendent lights will be placed around the outer walls and in the corners. Four mini spot lights along a 3 foot strip will be placed in each corner. These lights have the capability to be moved around to focus on different areas of the room. These lights would come from a British company called Heals and cost around $139 per fixture. These lights will help the lecture hall present a more executive look simulating actual professional conference settings. The finelite company will provide the series 12 lights that will be installed in the building. The series 12 comes in 4 foot sections and cost around $170 each.

Since natural light will becoming in from the west wall a blind will be installed to block outside light during presentations.

Small rooms: utility, bathrooms, and the staff offices will have a simple 2x4 lighting fixture that will offer appropriate office lighting. Hallways will use natural lighting and will include 4 foot strips of the series 12 for supplemented and low light situations.

Energy saving is a very important as part of the new addition. The T5s are a very efficient way of conserving energy. Motion detectors will be installed in each room and will sense if there is a body in the room and will control lighting appropriately.

Natural Lighting

Natural lighting plays a key role in the aesthetics and unique design of the north high building addition. The main components of the access to natural lighting are: a transparent glass roof, vertical light shafts, and the glass windows on the west wall.

The major means of providing natural light will be through vertical shafts along the north and south walls. Four feet of the upper level along these walls will be open; a space cut away to create a shaft of light through the ceiling of the first floor. Along this light shaft on the second floor will be a three foot high guard railing running between rooms. Glass walls will separate classroom and shaft for sound reduction and privacy. These shafts extend from west to east, the length of the addition. Two additional shafts run on the north and south walls of the existing bathrooms through the entry way.

This shaft is important in many ways. First, it provides natural light to enter the addition, and secondly, it allows the original building to maintain many important qualities. These include on the second floor many stained glass windows lining the library's north walls. Also, the existing windows in main hallway and second floor hallway in the original building will be maintained.

The glass roof will serve dual purposes primarily for the biotechnology laboratories; it will also provide most of the natural lighting through the addition. We are trying to make the glass roof as structurally and economically sound as possible. This is a central part of the uniqueness of our addition.

Thanks to Mr. Eddie Santamaria who gave us his thoughts on our building and the natural lighting aspect of it. He showed us projects he has worked on including a building for Winter Olympic trainees in which he used light podium to bring light into a certain area. Along with this, he also suggested a light cone to reverberate the light in the interior of the building. He inspired the class a great deal and we took a lot from his presentation.

The west wall faces 37th Street. The brick wall support at the parking level will be uniform and consistent with the existing building. The west wall will be entirely glass. This will add a thoroughly modern look to the addition and help add to one of the most important qualities of the addition, light.

Mr. Santamaria

During class, Mr. Santamaria came and presented to our class. He is an architect with 2 majors one of them in architecture. He went to Duke,

Utah University, and Yale. He had a really neat perspective and approach to architecture.

He spoke to us mainly about the things he has done before. His main example was a project he worked on in Utah. It was a building to house training Olympians. It was in this building that he had light podiums, which is something we might consider using in our project.

He also sketched out some ideas and discussed things that might improve the natural lighting in our addition. One idea was a cone of light to channel the light into the central part of the interior. This cone could be placed around columns that support, so it would help the aesthetics in that we wouldn't have to see a bunch of columns everywhere. He also discussed how we might be bale to use a form of a light podium to reflect the light down into the building.

I think the Mr. Santamaria was a great guy to bring in to present to our class. He really gave us a lot of inspiration, especially for the building we are designing. I think that making him one of our mentors would be a great addition to the architectural aspect of our engineering department, and would contribute a lot more than some of the others that have come in.

HVAC

HVAC plays a very important role in functioning of a building; this is a very critical part of the structure. These things are also very difficult to maintain and manage. The math required to get them perfect is somewhat difficult. One of our class mentors, Jeffery Patry with Schimmer Inc., has been coming in and helping with the calculations to find out the size of the air chiller, the amount of air needed to be taken into the building and the amount of air that needs to be taken out. This process if very long and can get confusing at times, especially when the floor plans are constantly changing, and the calculations for how much air is need in a room needs to be found out again. A lot was learned from Mr. Patry, we are happy that he was able to come in and help with the project.

Egress

The most important part of a building is not what is inside of it but how you get out. A flight of stairs will be placed on both the north and south sides of the building. Both stairways will go all the way down to the parking lot, where exits are easily accessible. Each stairway will have doors that swing outward so that if people are forced to leave rapidly, they can do so in the most efficient and effective way possible. If the doors were to swing inward, not only would it take much longer for a person to stop and

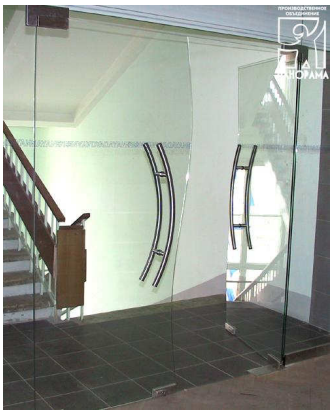
open it and therefore evacuate the building, but it would also mean that if a large number of people were trying to leave at once that there would be a huge risk of someone getting trampled.

The stairs will "snake down" to the parking lot, which leads directly outside.

Doors

To prevent traffic flow interruptions, all doors on the new addition will be set in an alcove that is nine feet four inches deep by three feet eleven inches wide. Above each door will be a sign signifying either engineering or biotech depending on the floor. Standards on the door will include panic bars that are thirty-two inches long by two and one-fourth of an inch wide, and shatterproof glass within the doors.

A manufacturer from Russia is a pending vendor for our doors. Other

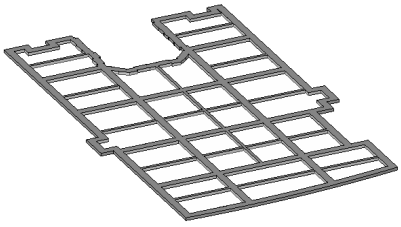


providers are from Shreveport, Louisiana and Omaha, Nebraska. After the estimates are sorted, the company with the lowest price with the best design and efficient use of materials will be chosen. We prefer the use of environmentally friendly materials to attempt to receive funds.

Physically, the doors will look stunning with metal framework embedded into the glass portion to support the doors but allow them to keep that sleek look. A special feature of the doors is that they allow for a long through-view of the other side. The modernized doors should give an impression of professional elegance to visitors of the building as well as staff and current students. The new entrance will add a futuristic feel to the main hallway and beautiful aesthetic properties with an elaborate design.

Roof

A new unique glass roof design will be placed over this addition to North high. The second floor science level will have a fifth teen foot



ceiling. A small green house may be included, above the second floor or on the roof. If the greenhouse is included on the roof on the building there will be a flat roof with sky lighting over the portion. This will include a glass roof dome for the greenhouse. If the greenhouse is under the third story roof the roof will have a trust like

structure supporting it.

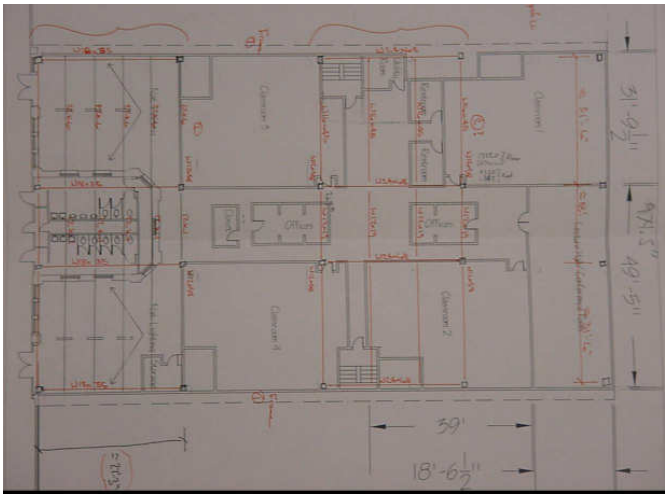
The first design was too heavy and didn't let in enough light. This design established a goal and shape for the roof and the support that was going to be needed for this project.

Subsequent design, reduced the metal structure, allowed the flow of light into the second floor addition to be more adequate. The project is based around the use of natural lighting. One consideration is controlling light and heat in the rooms high tech work area.

It will also provide its main purpose of keeping the sun off of the classrooms during certain hours of the day. The screen will not always be in the way of the sun, the screen will be retractable. This will provide a very crisp and modern look to the project.

Structure

The Haynes Addition will be a freestanding steel structured building. This means that there is no wall from the building connecting to the ground, which means that none of the walls carry load. What we are going to do consists of piers running from the grade to the top floor that will support the whole building. Underneath the first floor will be a parking garage. We will use twenty piers and they will be spaced evenly throughout the floor plan. Most of the piers will run along the outside walls. All of our piers are W12x19, W12x58, W16x45, W18x35, and W24x68. Our girders are going to be 12K1 and 22K6. To account for wind pushing against our building we will use a lateral frame concept. The lateral frame is located in the interior of the building, with I-beams perpendicular to each other to strengthen the structure.



Structure Plan sketch of the First Floor. The small boxes are representation of the pier placements. The red lines and letters are the pier and girder types.

Gantt Chart

The Gantt chart was created on Microsoft Project. The Gantt chart is a display table showing all the tasks carried out for the addition. More importantly, it shows the start and completion dates for each task, the duration to finish the task, and the team member in charge of each particular task; this information is displayed both on a spreadsheet and a calendar chart.

We decided to use a Gantt chart to help us make this project a little easier and more efficient. The most important lesson the Gantt chart taught us is how difficult it is in a high school situation to stay on task in a timely manner. We used this program to help us with efficiency and organization, and it has been an invaluable tool for us.

Costs

Thanks to the help of Leo A Daly architect Brad Schaap the cost estimating for our project was done using a cost guide called Marshall Valuation Service. First we had to find out what the costs were going to contain and what they weren't going to contain. This lead to what class of construction our building was going to be categorized under. We decided that it would be best if we used the class A construction indicator which is a steel structure using columns and beams all fireproofed, plaster and other non-combustible material. After all this we had to choose a method to use for the estimating. Mr. Schaap recommended that we use the calculator method which takes you through the cost guide book to select basic costs for certain aspect in our project. It came down to the Refined cost XCurrent cost multiplierXLocal multiplier= Final cost.

After choosing a method we had to decide what quality of construction this building is going to be. Standard high school buildings usually are in the good to excellent quality ranges, so we had to do a little averaging. On the Calculator method: Schools and classrooms page we found a square footage multiplier that fit our dimension. After applying all the general costs we had to account for the extra costs like the sprinkler system and the cost of the pilings which is added to the final cost. Finally after all that is when we had to do all the local, national and regional cost multipliers which account for time and location cost differences

- Acknowledgments

  Mr. Gene Haynes, North High Principal
  Mr. Lee Kallstrom, CEA teacher at North High
  Mr. Eddie Santa Maria, Architect

Mr. Jeff Patry Architect from Schimmer and Associates
Mr. Nick Schulze Architect from DLR Group
Mrs. Christensen, Curriculum specialist at North.
Mrs. Leeann Vaughan, Biotech teacher
Mr. Alan Dappen, Physics teacher
Mr. Walter, Physics Teacher
Adam Vanosdel, North High graduate

- Lessons Learned

Over the course of the Gene Haynes Addition project, our class gained a vast amount of knowledge and skills that were not there before. We learned how to plan ahead and to work as a team to accomplish a goal. In the initial steps of the project our team wasn't working together, but as time passed we gained experience and began to communicate better. To make this project as efficient as we wanted it required aid in many ways. One of our key mentors (Adam VanOsdel) told us that we weren't cutting it when it came to team work, so he gave us a little boost and we started to get organized.

Our team found out that to get to a comfortable point in our project that it was going to take time, patience and hard work. A long the way all of us also learned new things about the project that we didn't even think about before. Things like HVAC, structure, plumbing, electrical, costs, preparation were all introduced to us, and we weren't ready for it at first. Once understood, we could get a better control over what we did and what we needed to get done.