

Build a Boat in Three days

COSC 153 Project Report

by Kasey Funk

*This work is intended for Mr. John Nichols, instructor of course COSC 153, at Texas A&M
University.*

Acknowledgements

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John Nichols, Jim Titus, the wood shop staff, and the COSC 153 class of 2016.

Introduction

This binder holds the break down of the “Build a Boat in Three Days” project that was assigned to the COSC 153 class by Professor Nichols in early April of 2016. The project was comprised of the planning, designing, and physical construction of a 1/4th scale model boat that was inspired by boat plans dating back to 1902. The ultimate goal was to determine if building a boat in three days or less is able to be achieved. As one would assume, there was a great amount of time and effort put into the making of the boat and the presentation that followed. Throughout the course of the project there were many times that individuals struggled with their tasks, myself included. Although the seas were rough, the class worked as a team to complete the boat model in the amount of time that was delegated to them. We discovered the methods, procedures, and technicalities that must be identified, analyzed, and resolved to successfully construct a boat in a three day timespan.

Table of Contents

Section I: Journal Entries Marking Progression	1
Section II: Sub-Groups	26
Section III: Assembly and Time	29
Section IV: Conflicts and Difficulties	33
Section V: Conclusion	35

Section I:

Journal Entries Marking Progression

4/6/16

- Class met and discussed project layout including:
 - Goal of the Project
 - Work together to develop a detailed report of how to build the boat in three days, including a timeline of events
 - Sub-group Assignments, Leaders, and Tasks
 - Estimation: Leader- Joseph W.
 - Get AutoCAD file for boat specifications
 - Develop timeline of events
 - Estimate each step and their anticipated time
 - Design: Leader- Brianna H.
 - Come up with model of what the boat is anticipated to look like after each day of construction
 - Use computer program, such as Maya
 - Final product will show the boat with all of its components present
 - Writing: Leader- Claire S.
 - Collect all the information from the other sub-groups
 - Create a formatted report including the work done by the other sub-groups
 - Create a PowerPoint presentation as well as a printed out version
 - Expectations of the Groups
 - Each sub-group will share all work via Google Drive so that each member has access to the information that they may need

- Final Product

- Once the writing group has completed the presentation, any concerns or critiques will be discussed here
- The final product will be finalized and presented to Professor Nichols
- Sent out Google Drive links containing the information above to members of the class via email

Sub-group Assignments

Estimation Group	Design Group	Writing Group
<u>Joseph</u> Bradley Brian Chris V. Daniel Grady Kyle Mason Michelle Will Zac	<u>Brianna</u> Alysia Chandler Chris F. Coty Lauren B. Marcelo Richard Ty Vianca	<u>Claire</u> <u>Chiundra</u> Devin Emma Lauren H. MaClay Sean Trey

Subject to change

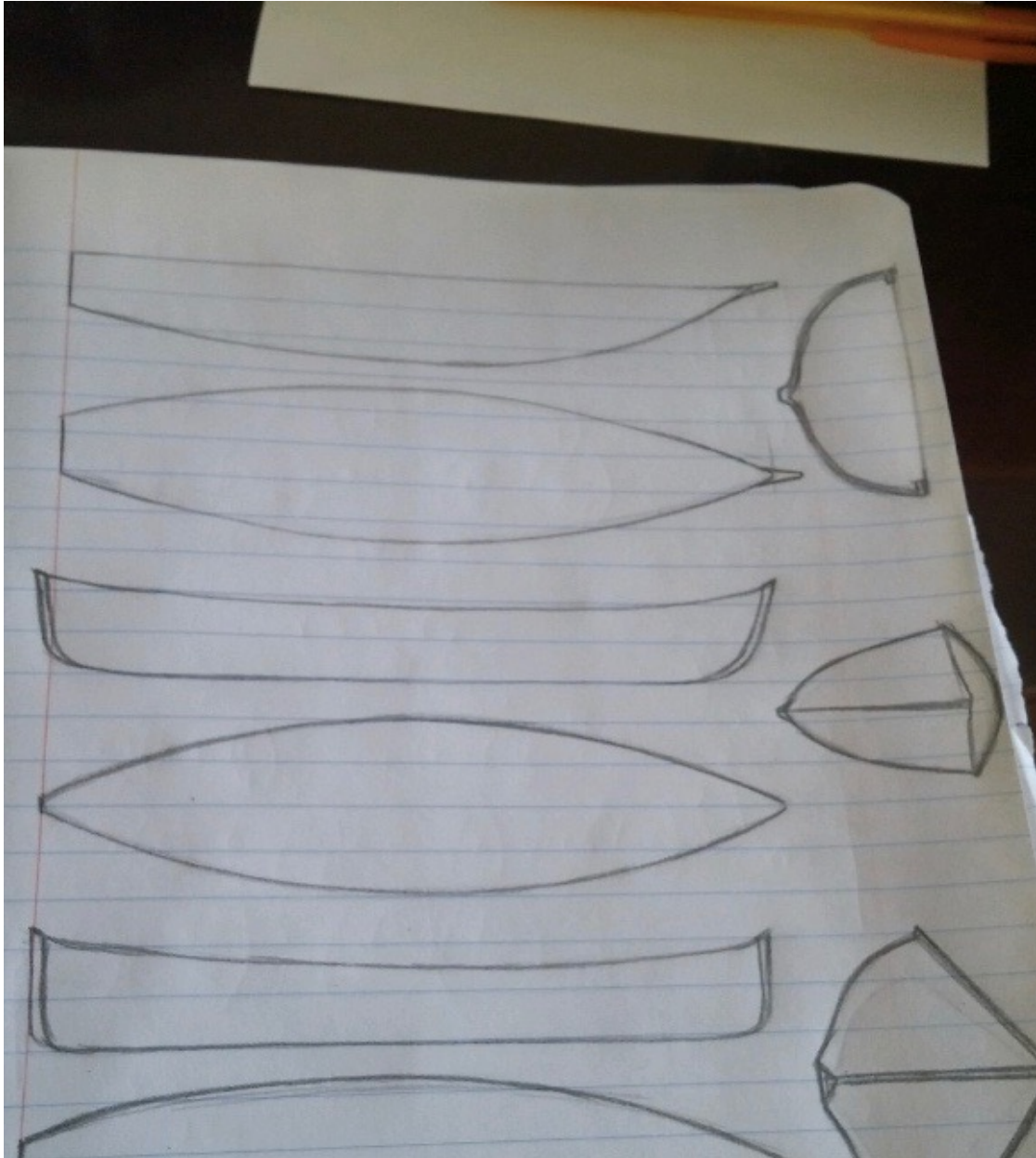
If anyone would like to talk with me about why you were put into a certain group or would like me to change your group assignment, please let me know,

-Kasey

4/8/16

- Design:

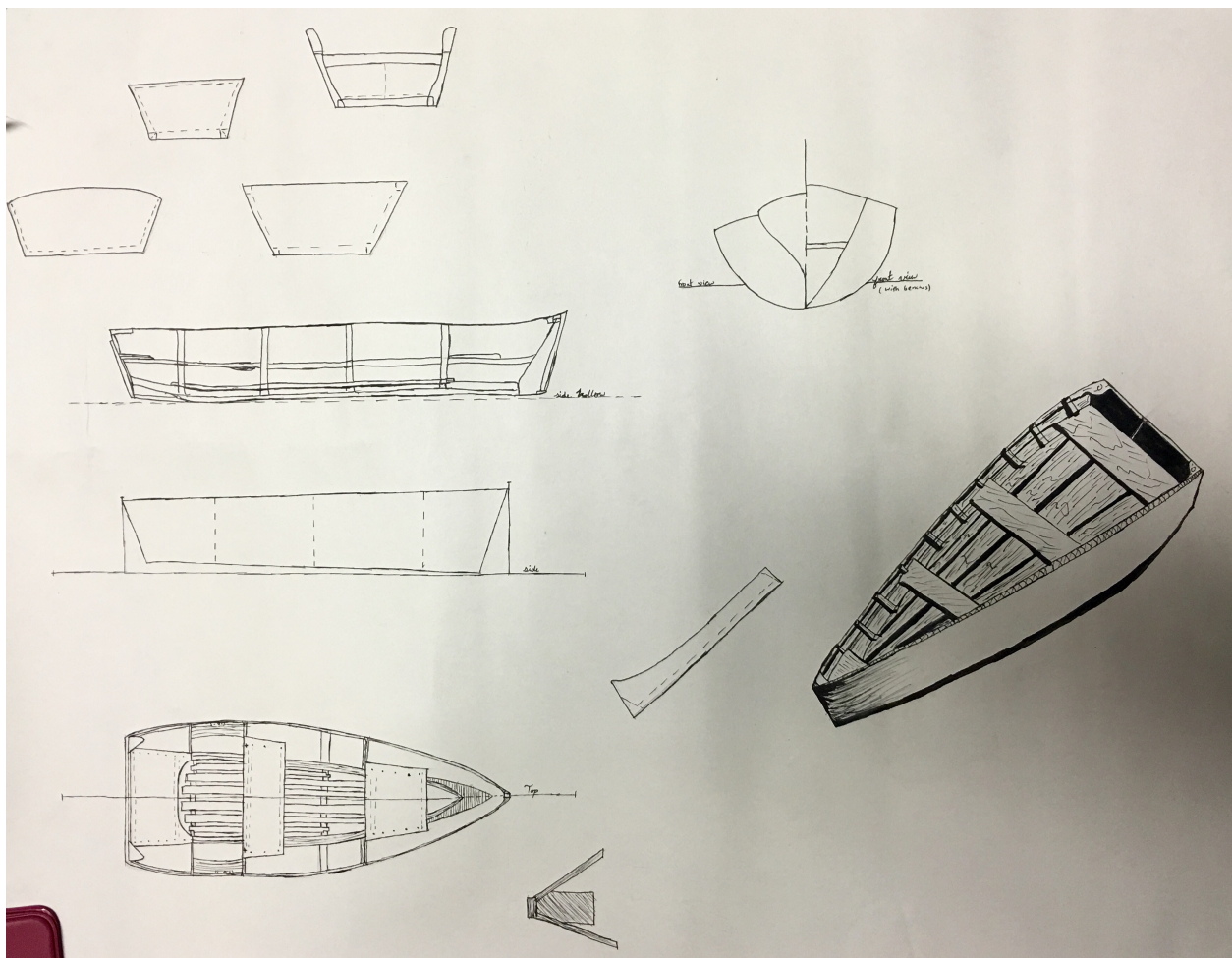
- Alysia G. created rough sketch of parts of the boat



4/10/16

• Design:

- Lauren B. did brief research on the boat plan and design and drew up some sketches as well
- Marcelo B. created boat drawing



4/11/16

- Created a Google Doc including a table to document all of the class members' contribution and the dates they did them

Boat Project Progression Document

Below is the table that will be used to document progress on the boat project. Please document everything that you do for the project. If multiple people work on a single task put all names in the 'Name' column. Do not forget the date. This will be incorporated into a binder and given to professor Nichols, along with the finished project. If you need to add more rows please do so.

Thanks,

-Kasey

Group	Name	Date	What You Did

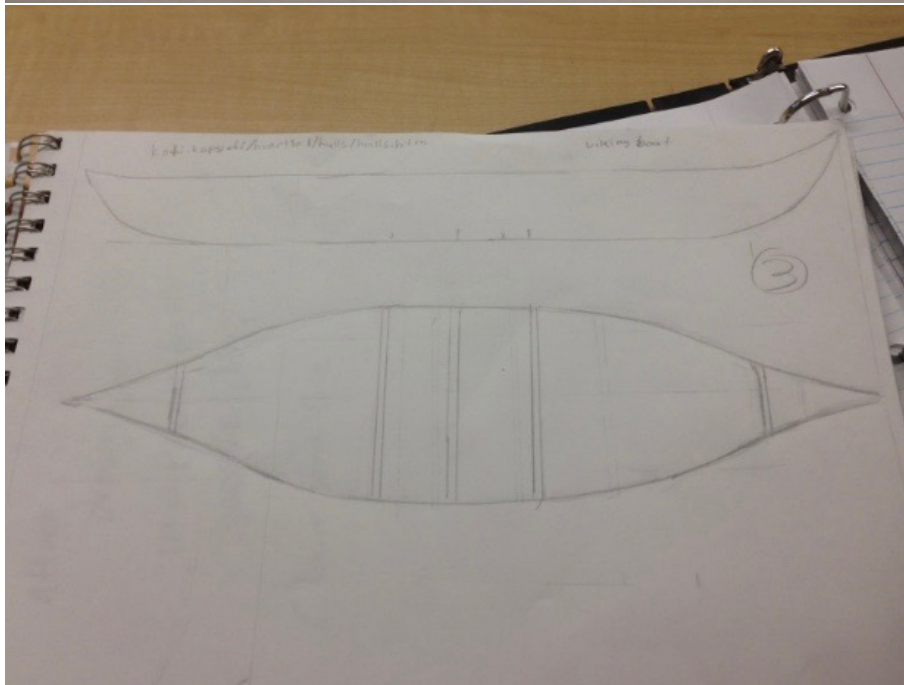
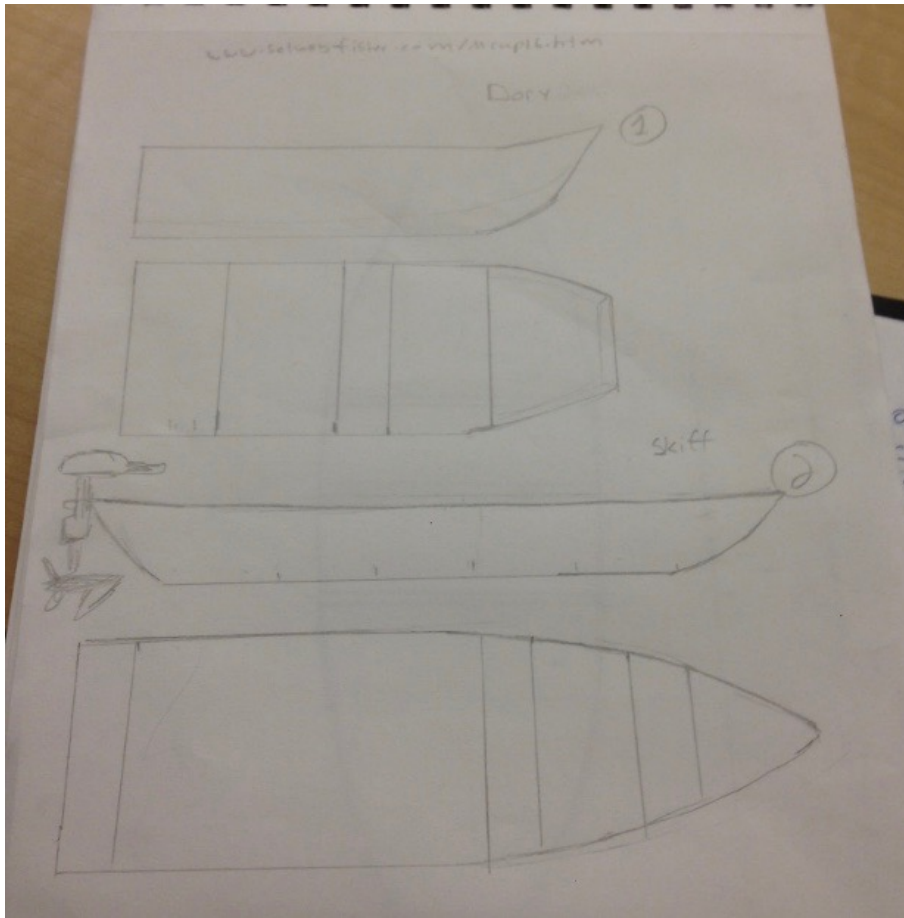
- Shared the Google Doc link with everyone in the class
- Arranged to split the class up so that part will be in the classroom working on the boat and the other part will be in the wood shop working on their bows (since both projects are happening simultaneously)

- Writing group will go to the wood shop because their tasks do not need to be completed until the later part of the project
 - Chandler B. from Design will go with them to help
- Estimation and Design will be in the classroom to discuss the plan and work on their tasks
- The plan above will allow for better time management

4/12/16

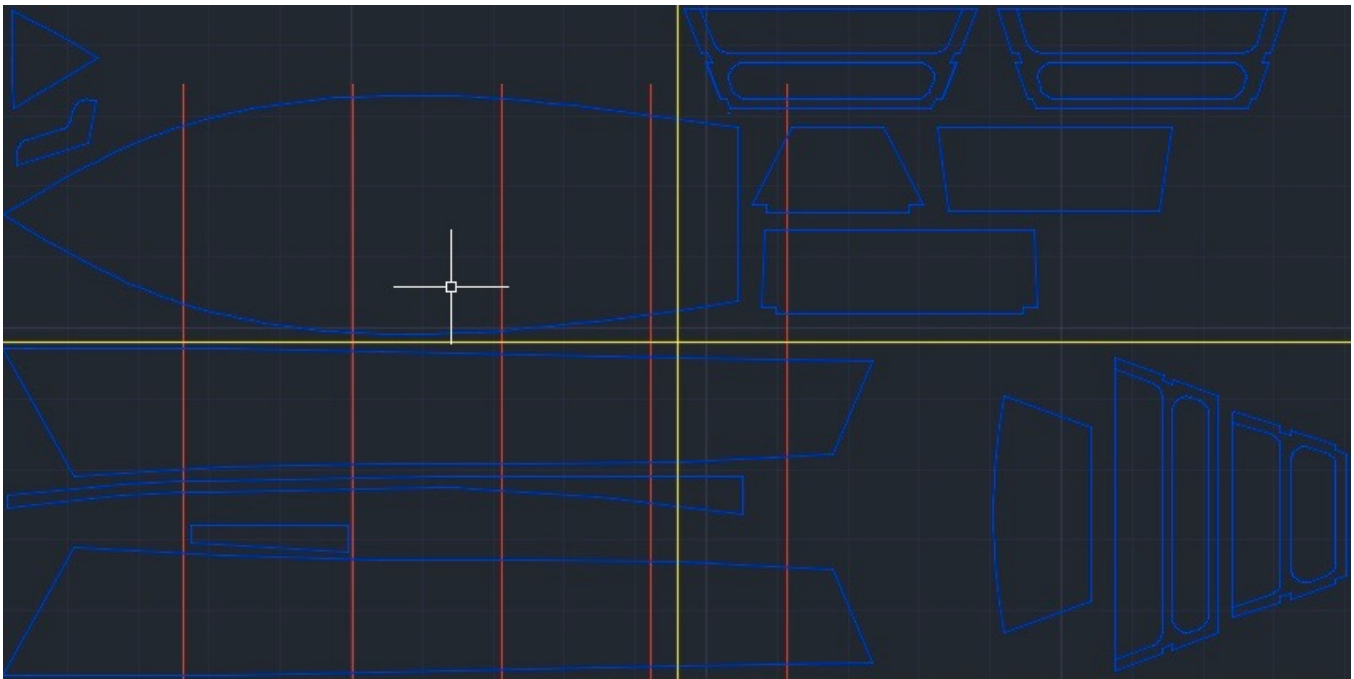
- Design

- Lauren B. drew three more versions of the boat design



4/13/16

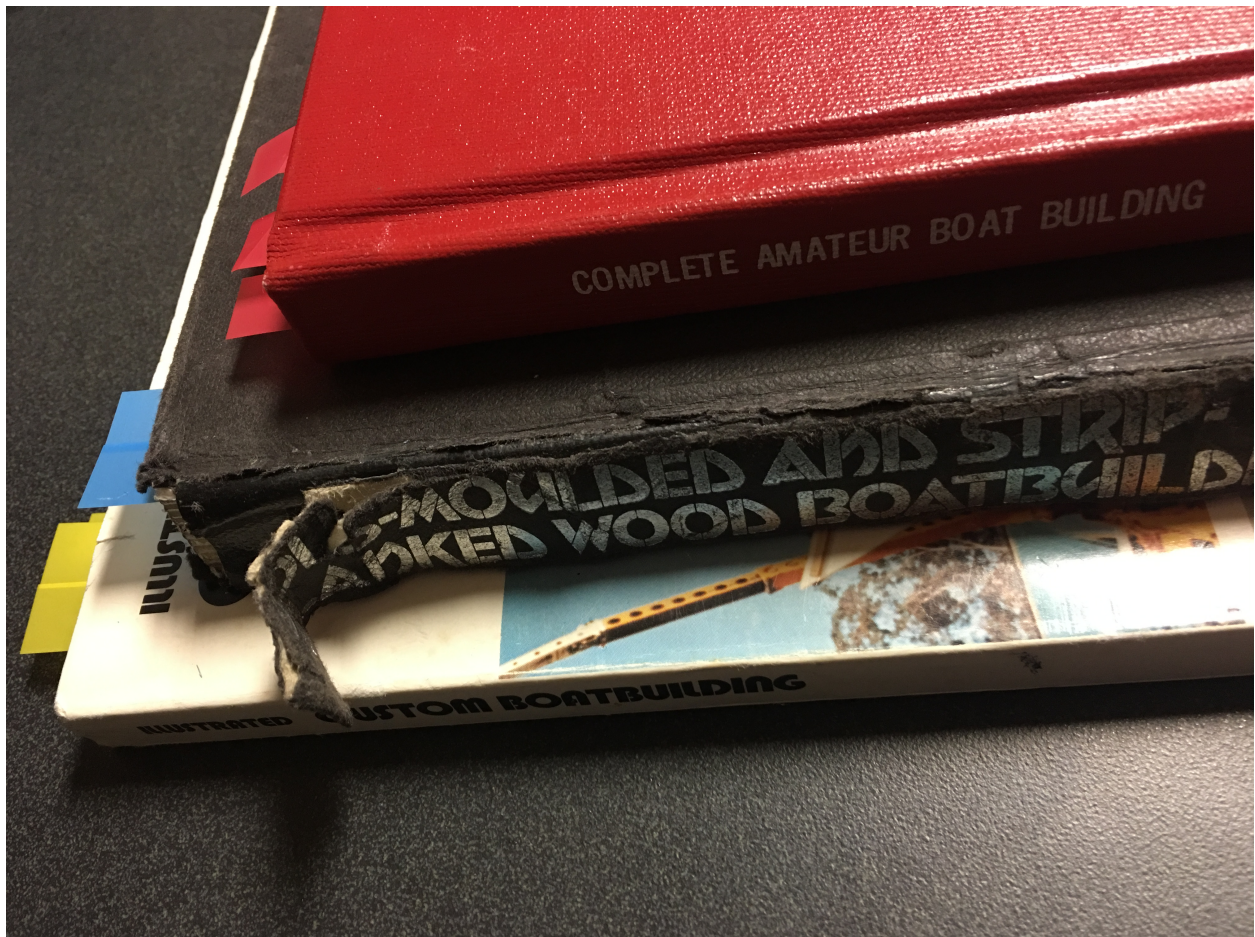
- Brought the pre-existing boat model from the wood shop in to the classroom to identify all of the parts and how they fit together
 - This will help Estimation put each step of construction in order
 - This will help Design visualize what their creations should look like
- Received the boat AutoCAD file from the wood shop

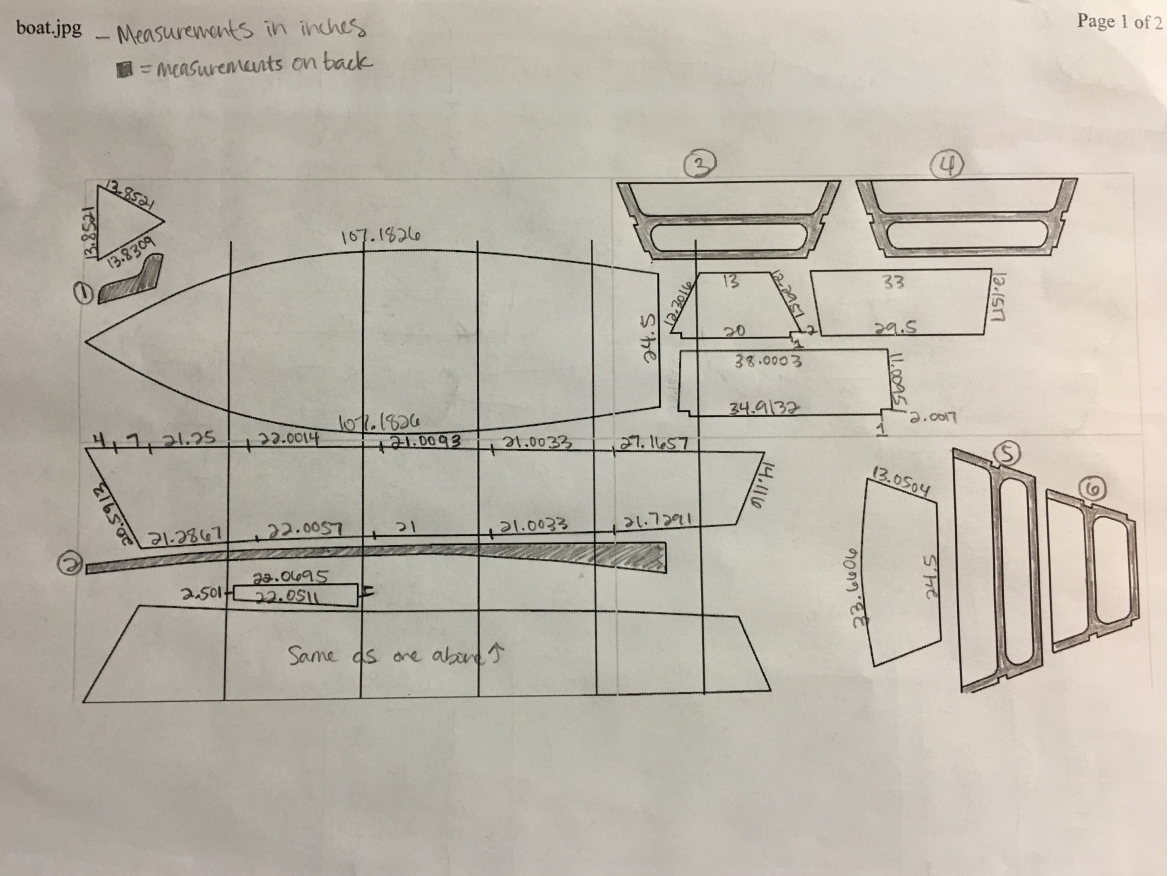
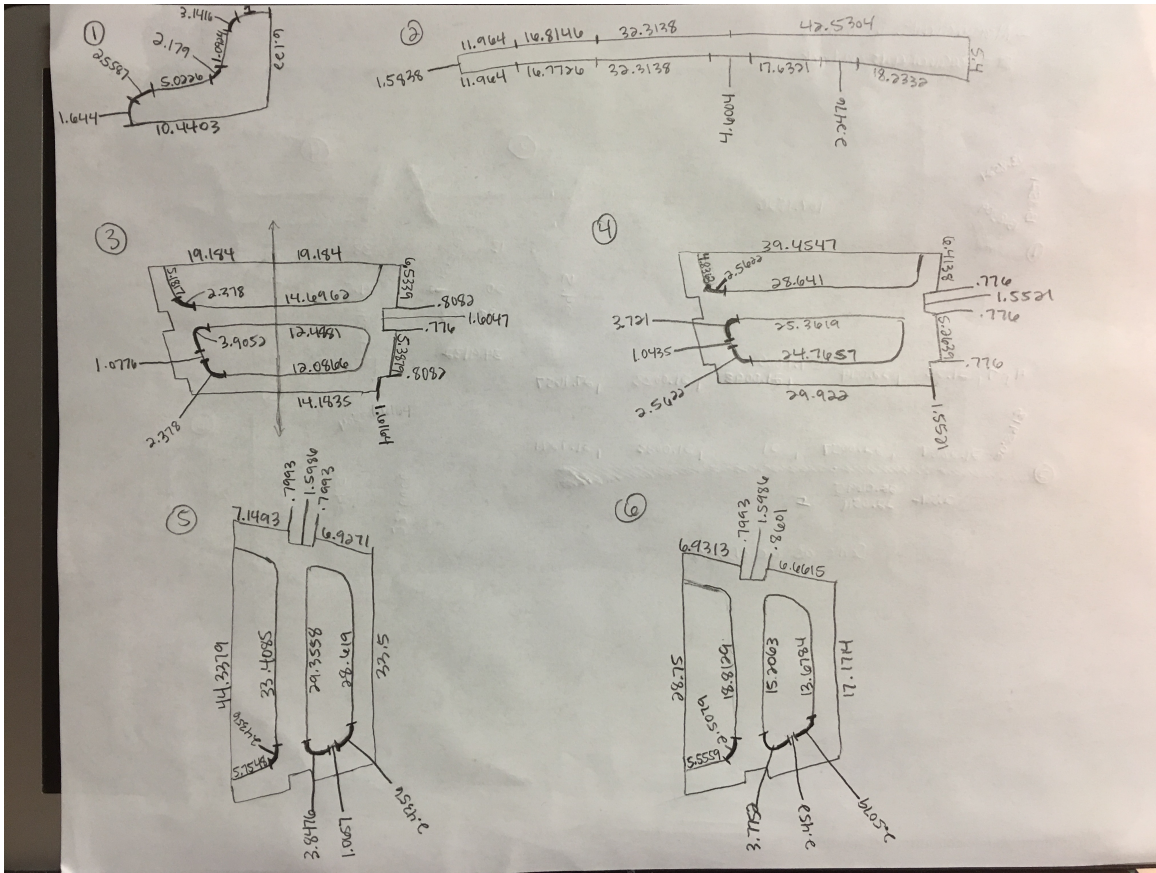


- Shared the file with the class
- Estimation looked over the boat model
 - Michelle C. looked up types of glue and their drying time
 - Joseph W. worked on coming up with ideas on how to get all the pieces together in three days

4/14/16

- Checked out three boat building books from the library:
 - *Complete Amateur Boat Building* by Michael Verney
 - *Cold-Molded and Strip-Planked Wood Boatbuilding* by Ian Nicolson Frina
 - *Illustrated Custom Boatbuilding* by R. Bruce Roberts-Goodson
- Will bring the books listed above to class Monday
- Placed tabs on pages that have pertinent information



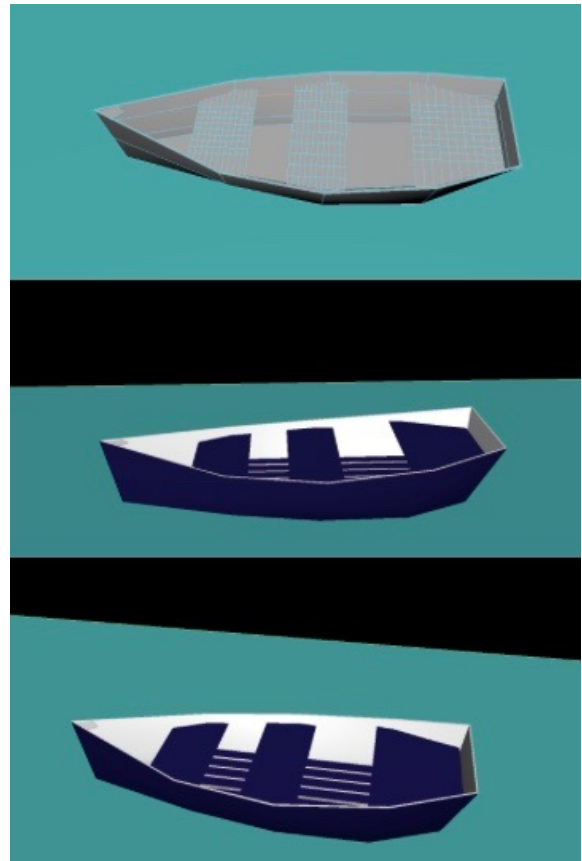
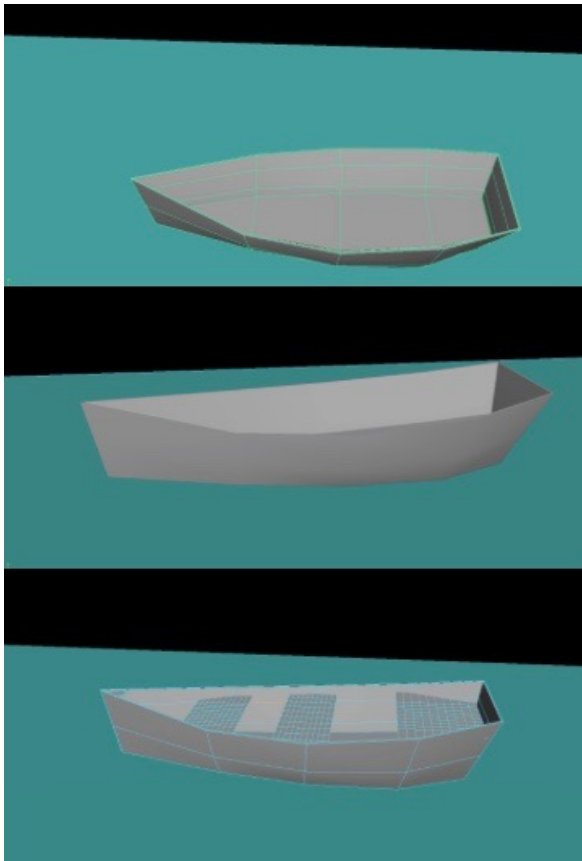


4/18/16

- Met in front of the wood shop
 - Some people worked on their bows while the rest of us discussed the boat project
 - Talked about whether we should use fast or slow drying glue for the best outcome
 - Fast drying glue:
 - Pro- Get it done quick (and in three days)
 - Con- Mistakes cannot be fixed
 - Slow drying glue:
 - Pro- Mistakes can be corrected if identified in timely manner
 - Con- Takes a long time (may not get it done in the three days, especially if no one knows what they are doing)
- Looked though the boat building book from the wood shop
- Learned how to get measurements from the AutoCAD file
 - Printed out a paper copy with all of the pieces on it and marked down the measurements
 - Dimensions are in inches

4/19/16

- Notified class to meet in front of the wood shop so that whoever would like to work on bows can
 - This set up worked well on Monday so we will continue this
- Brianna H. started working on a model that was made in Maya
 - The finished version is here



4/20/16

- Class was canceled but some of the class (very few) met at the wood shop to discuss the boat project including:
 - The cut out pieces
 - How to make the 1/4th scale model
 - Steps
 - Glue
 - Etc.
 - Referred to the boat building book from the wood shop
- Scheduled to meet up with a few classmates to work on the boat tomorrow at 2 pm

4/21/16

- Met with classmates to work on the boat model
 - Glued the keel on the bottom piece
 - This took about 35 minutes
 - Glue dry time for unstressed joint = 1 hour
 - Cut out the pieces that run horizontally down the sides of the boat
- Individuals who contributed:
 - Bradley P.
 - Joseph W.
 - Lauren B.
 - Michelle C.

4/25/16

- Went to the wood shop
 - Started making the strongback structure for the boat to be clamped to at 3:25 pm
 - Inserted frames at 3:37 pm
 - Glued them and stabilized them with clamps
 - Ended around 4:20 pm
 - Glue dry time for unstressed joint = 1 hour
- Individuals who contributed:
 - Bradley P.
 - Lauren B.





4/26/16

- Attached:
 - Transom
 - “L” shaped knee piece
 - Glue dry time for an unstressed joint = 1 hour
 - Front stem piece
 - Two of the bottom stringers
 - Glue dry time for a stressed joint = 24 hours
 - Started at 2:23 pm
 - Ended at 5 pm
- Individuals who contributed:
 - Bradley P.
 - Lauren B.



4/27/16

- Put top two horizontal stringers on
 - Glue dry time for a stressed joint = 24 hours
- Cut longer side pieces because the ones that were made with the AutoCAD dimensions were slightly too short for this boat
- Made 20 wooden clamps
 - These will be used tomorrow when the sides are put on
- Started at 3:25 pm
- Ended at 4 pm
- Individuals who contributed:
 - Alysia G.
 - Bradley P.
 - Emma T.
 - Richard R.

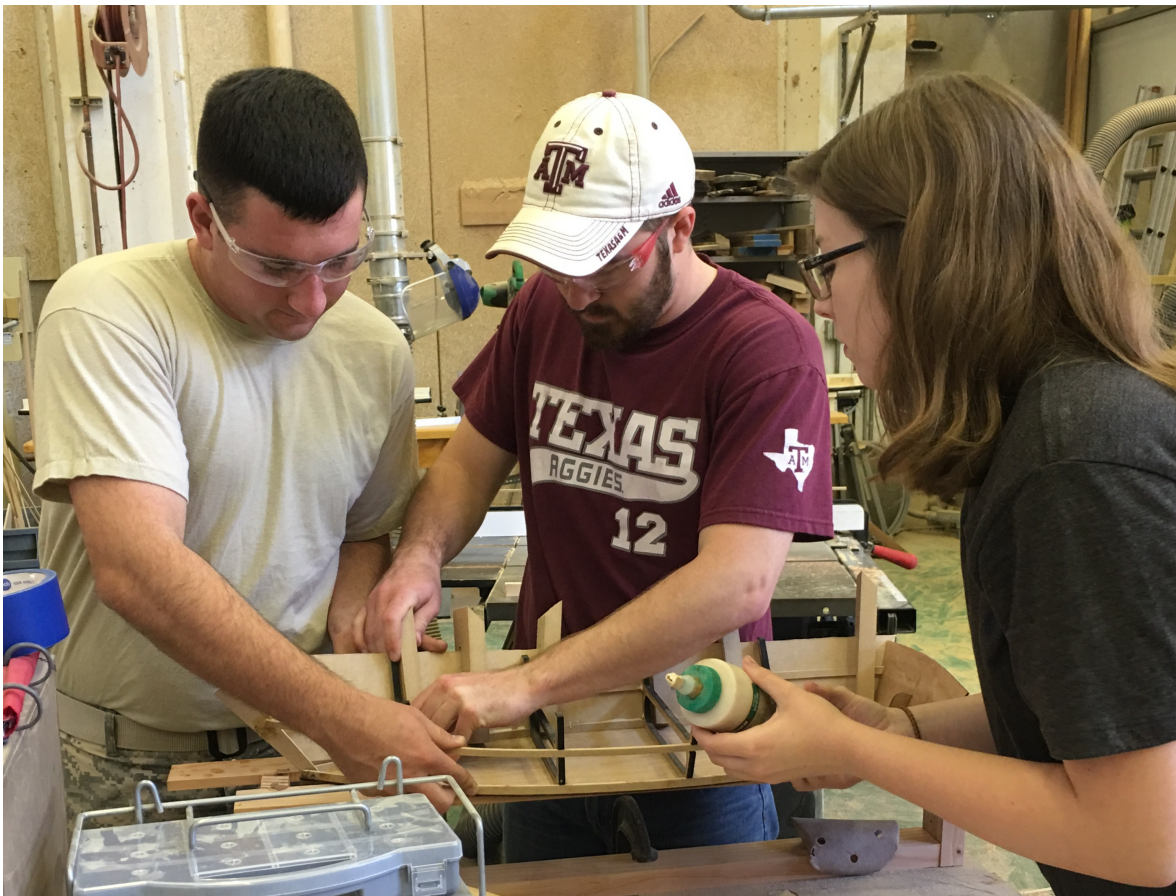






4/28/16

- Put both of the sides on the boat with wooden clamps that were made yesterday
- Glued sides
 - Glue dry time for a stressed joint = 24 hours
 - Started at 12
 - Ended at 12:30
- Individuals who contributed:
 - Alysia G.
 - Bradley P.
 - Joseph W.
 - Michelle C.
 - Vianca C.



4/29/16

- Cut off the top part of the two frames that do not have seats to support
 - Took about 10 minutes
 - Sanding the areas down took a around the same time, 10 minutes



Note: The floorboard, breasthook, and seat pieces have not been glued in yet.

4/30/16

- Painted the boat
 - This was optional; therefore, the time it took to paint the boat will not be incorporated to the total time
- Glued the floorboard pieces in
 - Took 8 minutes
- Glued the seats on
 - Took 15 minutes
- Glued the breasthook in place
 - Took 5 minutes
- Glue dry time for an unstressed joint = 1 hour





Section II:
Sub-Groups

Determining the Type and Number of Sub-Groups

When working with a large number of people, the whole class in this case, one would find it beneficial to divide the group up into smaller sub-groups. This will make working on the project much easier and more efficient. With a class of about thirty or so students, I split everyone into three different sub-groups. I determined that three would be sufficient by taking into account the size of the class and the tasks that needed to be accomplished for the project. The tasks included: estimating the time it takes, step by step, to build a full sized boat (Estimation Sub-Group)¹, designing the 1/4th scale model and producing computer generated models (Design Sub-Group), and writing/formatting/editing the final report and PowerPoint presentation (Writing Sub-Group).

Assigning Individuals to Each Sub-Group

While in class, I was able to get to know most of my fellow classmates. I saw how they participated in class, that is if they showed up, and how they interacted with one another.² I honed in on skills I saw people using and I took a mental note of it. I knew that some members of the class were more artistic and creative, while others were more analytical and practical. Of course, some individuals did not seem to express an overwhelming amount of talent in any specific area. I divided the class up by taking into account each person's skill set, work ethic, and

¹ Note: When the project was first assigned to the class the construction of the boat was only hypothetical. We were not going to physically build a model until about halfway through the project, when it was *strongly suggested* that we should build a 1/4th scale sized boat. This is why the group was given the title 'Estimation' rather than something that would be more fitting, such as 'Assembly'.

² Note: There was another project (making of English longbows) that was started before this one and overlapped. I learned a lot about different individuals during the bow project and applied the knowledge that I gained from my experience with them to the boat project.

compatibility with other individuals (refer to pg. 3 to see the full assignment list). It is important to get this part figured out so that the members of the class will be motivated to do their share of work. For example, I put Brianna H. in charge of Design because I know she is good at making computer generated models and put Lauren B. with her because they work well together. I kept using this pattern until I got to the individuals that were harder to categorize. Since a large amount of them usually do not contribute to the class, I put most of this section in Writing because I planned on doing the tasks assigned to this sub-group anyway.

Tasks and Expectations

Once everyone knew what group they were assigned to, they were then presented with their tasks and expectations. I explained what I wanted from each group, clearly and thoroughly, so that there wasn't any confusion or miscommunication. Everyone was expected to share their progress on the project with the other members of the class, via Google Drive, so that information could be accessed by other members. This type of organization creates a system that allows everyone to do their part adequately and check up on the progression or contribution of each individual.

Section III:
Assembly and Time

Boat Pieces

The pieces for the boat were cut out at a 1/4th scale from the AutoCAD file using the laser cutter in the wood shop. We made sure everything looked correct before starting. Once we knew everything looked right we then proceeded to the first step.

Boat Construction

When we were ready to start construction, we first started with the bottom of the boat by placing the keel on the bottom piece using wood glue. Then we made a strongback structure to hold the boat in place. We glued some pieces of wood together and clamped them so that they could support the boat. Next came the glueing of the frames in the right place and clamping them down. Then the transom and knee in the stern, stem in the bow, and the two bottom stringers were attached. The top two stringers were added and then twenty wooden clamps were made in preparation for the side pieces. Both of the sides were glued and clamped on and since we had the clamps ready from the previous day, it made this process go a lot faster. Then we had to cut the top parts of the two frames that don't support seats and then we sanded the areas down. The glueing of the floorboards, seats, and breasthook were last.

Time Each Step Took

Item	Time (minutes)	Glue Dry Time (hours)
Breasthook	5	1
Floorboards	8	1
Frames	43	1
Keel	35	1
Knee	19	1
Seats	15	1
Sides	30	24
Stem	58	24
Stringers	53	24
Strongback	12	1
Transom	37	1
20 Wooden Clamps	25	N/A
Sanding	20	N/A

Here is a table documenting the time each piece/step took. Total amount of time (not incorporating glue drying time) = 360 minutes, or 6 hours

When incorporating the glue drying time the pieces that can be put on at the same time must be assessed because that means that those pieces are all drying together at a similar rate. The transom, knee, stringers, and stem can all be assembled at the same time, so their drying time together would be twenty-four hours because that is the maximum amount of time any one of those takes by itself. The floorboards, seats, and breasthook can also be added on together, making their total dry time one hour. Everything else would have to be done by itself.

Here is the same table, but with the pieces that can be assembled together in the same cell.

Item	Time (minutes)	Glue Dry Time (hours)
Breasthook	5	1
Floorboards	8	
Seats	15	
Frames	43	1
Keel	35	1
Knee	19	24
Stem	58	
Stringers	53	
Transom	37	
Sides	30	24
Strongback	12	1
20 Wooden Clamps	25	N/A
Sanding	20	N/A

Total amount of time (incorporating glue drying time) = 58 hours, or 2 days and 10 hours

As one can see, the boat was able to be built in under three days. There was even a fourteen hour time frame for wiggle room for small mess ups or things of that nature.

Section IV:
Conflicts and Difficulties

Work Distribution

In the beginning of the project, I had split the class into three different categories so that more work would get done in the amount of time we had; efficiency is key. By doing this it made things easier, however, not everyone in each of the three sub-groups was active. The amount of work was not distributed evenly because the select few people contributed their time and effort to progressing the project, whereas a large majority of everyone else did nothing. Even though I expected this going in, it was disappointing to see and it made it hard on those that cared about completing the project.

Construction

Throughout the construction process there were barriers that we ran into. For example, the side pieces that were cut out using the detentions from the AutoCAD file were too short lengthways. We found this out when we measured them against the frame. So we cut out new pieces that were longer so that they would fit correctly. We could not use the regular metal or plastic clamps that were available in the wood shop for the sides because they would not work due to the curve. We made twenty long, skinny wooden clamps to solve this problem. Attaching the stringers to the stem was also difficult because of the angle of the bow. We had to put a great amount of effort in keeping the stringers and sides to the stem because this was the site of the most amount of pressure.

Section V:
Conclusion

Reflection and Concluding Thoughts

Overall, I consider this project and its outcome a success. Even though the main contributors struggled throughout the process, the final product was worth it. The task given to us was to answer the question: Is it possible to build a boat in three days? The answer to the question can be found in the evidence of our data. The building of the boat took a time that equates to two days and ten hours, which is less than three days. I know that this was just a one-fourth scale model, so building one that is four times larger would more than likely take longer than the two days and ten hours we spent on ours. Would it take another fourteen or more hours for the full sized boat? I highly doubt it would take that much longer, especially if more people were working on it and taking shifts. So yes, I believe this boat can be built in three days. If you have all of the items you need and a set of determined individuals, a lot can get done.

Leading this project has been a stressful, but great, experience. Managing people, organizing tasks, scheduling work time, building, and solving conflicts are all important aspects of the construction field. This project has expanded my knowledge and experience in each of these areas. Even though this was just a project that was assigned to the Introduction into Construction Industry class, it has shown how important real world construction projects are.