

Revision of the ArchiCAD Manual for CM 115

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Each CM 115: Fundamentals of Construction Management section contains a quarter long project, the goal of which is to familiarize the students with a modeling software. More so, the goal of the project is to introduce them to a set of construction documents- how to get started, what is included, what they need to pay attention to as a construction manager, and most importantly, to implement what they learn from their written coursework completed during class. This manual was written to help students complete this assignment to the best of their ability, producing a piece of work that shows they have a full understanding of these goals. Currently, the majority of the sections use Revit created by Autodesk, however, one section uses ArchiCAD, created by Graphisoft. After working with the students, and guiding them through ArchiCAD, it has become clear that there are certain common challenges across quarters. The current manual needs to be updated to clear up these gaps from earlier versions. This senior project focuses on targeting those issues and resolving them so that the student has a clearer idea of what is required of them and what they are to learn from this project.

Key Words: ArchiCAD, CM 115, 3D Visualization, 3D Modeling, Building Information Modeling (BIM)

Introduction

ArchiCAD is a modeling software owned by Graphisoft, created in 1982 in Hungary (Quirk, 2012). It is predominantly used in Europe but has slowly started gaining traction in the United States as an alternative 3D modeling software to Revit, owned by Autodesk. It was originally created for Apple Macintosh operating systems (Quirk 2012) but has since been refined to operate on Windows systems as well. ArchiCAD has the ability to model in both 2D and 3D and is known for being able to store large amounts of information within the 3D model (Wikipedia, 2019) which can then be used for accurate quantity take-offs and estimating in the construction industry. This program is interoperable with more traditional modeling software used here in the United States, such as Revit owned by Autodesk, Rhinoceros owned by Robert McNeel & Associates, and Sketch Up owned by Trimble. Building information Modeling is becoming a huge part of the construction industry, so knowing a little about all the programs available, or at least knowing how to manipulate a file so that it's operable on a familiar software, is crucial for prospective construction personnel.

History of CM 115 Fundamentals of Construction Management

CM 115, Fundamentals of Construction Management is the first lab in a series of labs that students within the Construction Management major must complete. Approximately 12 years ago, a 3D visualization component was introduced to the class. One of the software chosen was ArchiCAD due to its easy and user-friendly interface. It was evident that many students had a hard time visualizing 2D plans in 3D, so a project was proposed that requires the student to create a mixed-use building, using a 3D modeling software. From the model students are required to create a set of construction documents. The goal of the project is to familiarize

students with a set of plans as many students in the class are first years and haven't been on internships which expose them to these types of documents. In addition, by having the students create their own set of construction documents it forces them to be aware of what they need to look for when out in industry. Their plan reading skills increase, meaning they're more effective and efficient on the job site.

For many students this is the first time being exposed to a modeling software, meaning there is learning curve. Across quarters students have struggled with the curve and the timeline of this project, as the whole project is to be completed in 10 weeks. Since the implementation of ArchiCAD into the program, user manuals have been created to help mitigate this learning curve by guiding students through the tools of the program- how to use them, edit their components, and modify their specifications. The most recent manual was written for ArchiCAD 18, and while it is still effective, it needed to be updated.

Process

Working with the students over numerous quarters has shown there are certain parts of the project that consistently prove to be a challenge. Students typically struggle with the identifying the project deliverables, the timeline, and learning the software. It was clear that in order to produce better results, students need more guidance.

Project Scope

The first edit made to the manual consisted of outlining a project scope. Frequently, students are unclear of what is required of them since a written project scope was not provided to them. It was traditionally regaled to them verbally in class and if the student wasn't there mentally or physically, they missed the overall specifications of the project. The new manual provides the students with a written project scope, detailing the specifications and the deliverables on page one.

Project Schedule

The next addition made to the existing manual was the project schedule. This project is fast paced, and students typically fall behind mid quarter and struggle to catch up near the due date. The timeline provided in the new manual outlines weekly what the student should have completed with additional notes detailing concomitant information. In addition, intermediate due dates keep students on track and give the professor a chance to correct their work before their final submission. A schedule was tested Spring Quarter 2019.

Software Familiarization

To lower the learning curve, the new manual steps the students through the unchangeable specifications of the project, such as the site dimensions, building dimensions, and the structural components of the building. The directions become a little more obscure in regard to the creative aspects of the project in an effort to force the students to explore the program and to think for

themselves about the flow and design of their building; the goal of this is to introduce students to the architect's role in the construction industry. An additional resource for students was introduced Spring Quarter 2019, in the form of an "ArchiCAD Q&A" page on PolyLearn. Students could ask questions to their peers as well as the teaching assistant about the program and how to solve any technical problems they ran into. The goal of the increased guidance is to expedite the familiarization process, so students spend more time completing the project deliverables than they do figuring out how to manipulate the software tools.

Results

Students responded well to the additional help and resources provided to them during Spring 2019, producing complete and more creative projects compared to previous quarters. There is an overall increase in 3D visualization across the students, and a greater understanding of construction systems. Because the project requires students to create their own space they have a better appreciation for the architect's role, which yields greater interdisciplinary collaboration.

At the end of Spring Quarter 2019, students were asked if having a manual stepping them through the project would have been helpful- 90.5% of the students responded with "Yes," and 9.5% of students responded with "No."

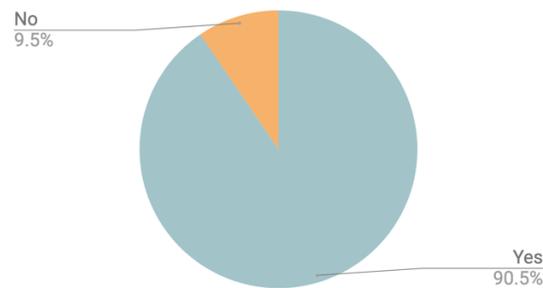


Figure 1: Student Response to Written Manual

Students were also asked if the schedule provided to them at the beginning of the quarter was helpful- 42.9% of students answered "Yes," 42.9% of students answered, "Sort Of," and 14.3% of the students responded with "No."

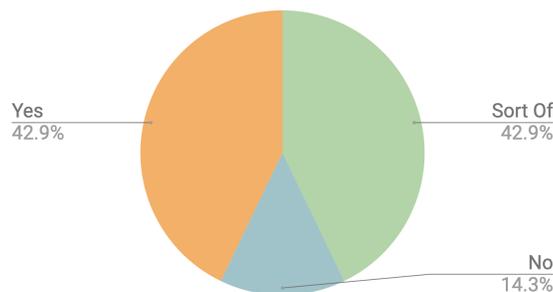


Figure 2: Student Response to Suggested Schedule

Finally, the majority of students in the class verbalized that the "ArchiCAD Q&A" was useful.

Lessons Learned

Overall, the student's enjoyment with the project increased as more resources became available. The general consensus among all the students in the class was that they preferred the steps written out rather than spoken verbally. In addition, by beginning the quarter with modeling the structural components, students had more time to think about their building layout, and the results were more thought out and creative floorplans. This was incorporated into the manual by making Phase 1, structural modeling.

While the survey conducted at the end of the quarter revealed more students wanted an updated manual than a project schedule, students who adhered to the timeline and the intermediate due dates felt the project was more manageable than those who didn't. They also produced better final results.

The "ArchiCAD Q&A" was extremely helpful from the instructor's point of view. The students didn't use it as intended but it was an efficient way to contact all students at once, remind them of due dates, write out steps that were a common challenge, resolve common technical issues, and post good examples that students could reference. While students didn't post, a large majority stated that it was very helpful having this resource to go to- students felt reassured that they had a way to ask for help when, or if, they needed it.

Conclusion

This manual, in addition to the other resources provided, allows students to focus on the objectives of the project, bypassing the learning curve associated with mastering ArchiCAD, yielding more complete and accurate models. In addition, this project enhances the collaboration among the disciplines in the construction industry. It introduces first year students to not only their job as a construction manager, but the architect's job as well-it teaches them to understand and appreciate each role in creating a building. This manual can be adopted by any professor teaching CM 115, and due to ArchiCAD's interoperability with other traditional architecture software such as AutoCAD, Rhino, or Revit, it can be tailored to include those programs; meaning in the future this project and manual can be expanded by adding project requirements integrating other programs used in the construction industry.

References:

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