Implementation of Bluebeam to the Fundamentals of Construction Management Course

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This project based senior project was brought about by Paul Weber and Matty Reed and was originally intended to take the paper-based binders from the Fundamentals to Construction Management course and organize these binders in Bluebeam. Bluebeam is an industry standard for nearly all construction projects, and an early adoption of the software could allow students to familiarize themselves with a tool that they will use after college or during internships. After deliberating with Paul, we concluded that we could better educate students by creating exercises that allow students to learn the tools available in Bluebeam through interactions in the course. From this, I sought to create interactive guides that would explain how to use tools like hyperlinking, optical character recognition, and tool sets as well as reasons as to why these tools could be highly beneficial for students within the industry.

Key Words: Bluebeam, Hyperlink, PDF, BIM

Introduction

The Fundamentals of Construction Management course is the first major lab that Construction Management Students will be enrolled in. This is the first time that students are introduced to topics such as:

- Quantity Takeoff's
- Scheduling Procedures
- Use of software such as AutoCAD, Revit, and Bluebeam
- Building codes
- Construction Terminology
- Specifications

These are all incredibly important topics to cover, as they offer students a foundation of understanding to build off. However, it was after my internships with general contractors that I realized just how important Bluebeam is. After a reflection period leading up to taking this project, I concluded the implementation of Bluebeam this early in the curriculum could lend students to being more efficient in future labs and in the workplace.

Project Goals

The main focus in this project is to introduce students to Bluebeam software as early as possible in order to give them a head start on the skills that will be necessary in further labs and within their careers. Understanding the basics of this software will allow students to be more confident in their abilities to analyze documents and perform takeoffs. They will also gain the added benefit of vastly improved efficiency. All these things can add up to an atmosphere where students can jumpstart their college and career success.
General Background of Bluebeam

Bluebeam is one of the most widely used document management software’s in the construction industry and it allows people to perform tasks that are unavailable to any other pdf editors. Before the digitization of contract documents, hundreds or even thousands of papers were used to manage job sites and the communication between parties was abysmal in comparison. However, with this software users can perform estimates, mark up plans with RFI’s, and collaborate on plan changes with everyone involved on the project. The widespread use of Bluebeam on all types and sizes of projects makes it extremely appealing to nearly any contractor.

Project Process

Original Ideas

This project was discussed between me and Paul Weber after being originally introduced by Matty Reed, where we first discussed what both of our goals were. The initial impression was to create an easy to use pdf version of the current curriculum to allow easier uses for students. This included things like organizing and bookmarking the existing course material, creating overlays to prevent cheating on material, and using hyperlinks. Over time, this developed into creating interactive pieces for students to do themselves. The main portions I covered in this project were hyperlinks, optical character recognition, and the use of tool sets. Paul and I also developed materials for future projects to expand on my project.

Hyperlinks

Hyperlinks are a tool that can be used in Bluebeam that allows the user to click on a link or portion of a page to be redirected to different locations of the pdf. This portion of the project was implemented in few different ways. With the current online learning, the class is set up on BIM 360, a website that allows Paul to upload course curriculum and videos for students to use. This website is inherently
more complicated to utilize when trying to skip between pages in a document and does not allow any linking functionality. With Bluebeam, I was able to link students to instructional videos for exercises directly on the page. This was used to watch videos about creating projects in Revit and AutoCAD and allowed a streamlined learning process for students.

Second, I created an interactive exercise for students to use hyperlinks in multiple ways to allow them to navigate course material and relate this to potential industry uses. In the first portion of this exercise I explained industry uses of this function. These include creating tables of contents for specifications, linking callouts directly to details, and linking RFI’s or submittals directly to contract documents. For the exercise, I wanted to have the students bookmark the table of contents for one of their many packets, as well as utilize hyperlinks to details in an example of some structural drawings. To illustrate this, I wrote step by step instructions of how to access the tools in Bluebeam and explained the purpose of each function in these menus. This includes references to pages and in this lesson specifically, I create an exercise for students to reference viewpoints of a single detail from a callout on the documents. I also created a video performing these tasks on a similar document to answer any potential issues students may have regarding the assignment. After viewing these instructions, students would be able to better understand how to utilize the menus that allow them to perform these tasks, such as figure 2 seen below.

![Hyperlink Action Menu](image)

**Figure 2: Hyperlink Action Menu**

**Optical Character Recognition**

Optical character recognition (OCR) is another tool that can be leveraged to increase work efficiency in work situations. The tool works by making pictures and scans of documents into text that can be recognized digitally. This can be incredibly important when working with contract documents that may not be available digitally. This tool is particularly easy to use, but incredibly useful in several ways, which is what I set out to explain in my instruction and exercise. Once again, I started this lesson by giving reasons why this tool is important and encourage students to brainstorm ideas as well. Suppose you are renovating a project that only has physical drawings and specifications. Typically, any keynote, product requirements, and other miscellaneous information is going to have to be sorted by hand. Instead, we can use the Optical Character Recognition function, creating a digital footprint for the document. Any keyword that may need searching can instantly be recognized by the software. Within a matter of minutes, the user is able to exponentially increase productivity when searching through these contract documents. There may also be additional information that could be missed when hand filtering information, allowing this software to act as a measure of quality and consistency from the user as well.
For the actual exercise, I asked students to pick a book, magazine, or newspaper to analyze. By scanning and converting to pdf, they could now access the Bluebeam tools necessary for them to convert the document into a readable text. Next, the students are tasked with opening the menu seen in figure three. This menu allows students define what will be scanned as well as instructions for Bluebeam to further edit the document for easier use. The lesson explains that Bluebeam can auto-orient documents, recognize images as well as text, and detect multiple different types of text on a single document. After students perform the OCR, they are to keyword search within this document to ensure that the OCR is accurate, and the lesson comes to an end.

![Figure 3: OCR Function Menu](image)

**Tool Set**

One of the biggest components of this class is the portion revolving around quantity take-offs. This portion of class is about fifty percent of the curriculum, and involves calculations and strategies involved when calculating quantities needed for various construction components. These measurements are hypothetical and serve as a great basis for students to begin to understand how to estimate material requirements for buildings, so the implementation of this through Bluebeam should seemingly be extremely easy and intuitive with the tool set function. The tool set function allows a user to create different types of measurements that can later be organized and catalogued across pages. This function makes for easier and more efficient quantity takeoffs on more complex or multifaceted drawings. I once again tried to emphasize this and encourage students to brainstorm in this lesson while offering useful workplace scenarios for the function. The tool set can be used for area and volume measurements for concrete pours, linear footages of lumber, quantity of electrical conduit or light fixtures, and everything in between.
For this exercise, students are tasked with utilizing structural drawings within the packets as seen earlier in the Hyperlinks exercise. Within these drawings are floor plans seen in figure four. These plans include plywood subfloor placements, rafter measurements, and several other components needed for the framing of a Revit model. Students may pick any component to measure or follow my example in the TJI joists on the second-floor framing plan. They must create a new tool, calibrate their measurements, and perform the takeoff using this new tool.

![Figure 4: Framing Plan for Tool set Exercise](image)

**Constraints**

One of the original components that played a large role in the project was the introduction of three-dimensional PDFs. This was agreed upon to help students better understand what they are looking at on two-dimensional plans in an interactive view. This would be a major help to students who are just beginning to learn how to visualize these construction components. However, with the issues presented by Covid-19, I was unable to provide this. Lack of access to a computer capable of running Revit and exporting to Bluebeam resulted in Paul and I reserving this feature until future projects that may come about in the near future that will build upon my project.

**Future Projects**

One of the most important things that was reiterated over the course of the discussions on how to execute this project was how this lends itself to future improvement. I was creating the building blocks to a bigger and better adjustment to the curriculum through Bluebeam by creating these initial blueprints on how to use tools. Students will continue to learn and give Paul feedback after I am gone, and I am hoping that other students can utilize this as a basis for their project as well.

**Conclusions**

I am very satisfied with the way Paul and I were able to come together and use both of our ideas to come to a conclusion that will help students learn practical skills for future labs and industry.
experience. We both had a great level of promise for this project, and I learned a lot about how a classroom operates, what a curriculum is trying to instill in students, and how different it is to teach instead of learn. I found gaps in my own understanding with these basic tools, but I found new and interesting ways to use Bluebeam. I am excited to see how Paul implements these exercises in his class and the effects it may have on students after I leave Cal Poly.