Getting Started with PreTeXt

Virtual Workshop 2023

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Preface

PreTeXt[1] is a document authoring system that allows you to convert the source of your document into a variety of output formats, including fully accessible webpages, PDF, Epub, Jupyter Notebooks, and braille. This "write once, read anywhere" approach has made it a popular choice for authors of Open Educational Resources, but PreTeXt can also be used to create other kinds of mathematical documents as well. Recent updates make this process much easier; there has never been a better time to get started with PreTeXt.

Participants of this workshop will be introduced to the fundamentals of authoring documents with PreTeXt and gain the technical skills required to work with it. Specifically, participants will learn how to:

- Use GitHub Codespaces to create an editable PreTeXt document in their web browser.
- Write and structure content using PreTeXt markup.
- Add content to the document, including mathematics, graphics, interactive exercises, and more.
- Build accessible and interactive webpages as well as a static PDF from the same PreTeXt source.
- Easily deploy the interactive webpages online (for free).

We will also share tips for converting existing documents into PreTeXt.

Prior to the workshop, participants should have some familiarity with LaTeX or other markup languages. No previous experience working with PreTeXt or HTML/XML is assumed. Participants should bring a laptop that can connect to JMM's provided wifi: no prior installations will be required as we will use PreTeXt's new GitHub Codespace-powered online authoring service.

[1] `pretextbook.org`

Contents

Chapter 1

Before you arrive...

Authoring in PreTeXt requires nothing more than a wifi connection and GitHub account. GitHub users also can share their content for free on GitHub Pages!

1.1 Setting up your GitHub account

To create a GitHub account, follow the instructions on GitHub's signup page.[1]

Be sure to note your GitHub username and password in your password manager (or however you usually keep track of login credentials) so you can log in again durring the workshop.

1.2 Apply for your GitHub Education discount

Educators and non-profit researchers can get many of GitHub's paid features for free.

Apply at Education.GitHub.com[1] to unlock these features (in our experience, applications are usually processed quickly for `.edu` email addresses).

1.3 And that's it!

Even just a last year, the process to get started writing PreTeXt involved several more steps. (Raise your hand if you don't care what a "PATH variable" is!)

The community is streamlining this experience daily, and we look forward to sharing how easy writing in PreTeXt is when we see you at the workshop

[1] `github.com/signup`

[1] `education.github.com/discount_requests/pack_application`

Chapter 2

Write Once, Read Anywhere

Objectives

At the end of this chapter, you'll

1. Become aware of the eleven PreTeXt Principles.
2. Be able to identify several features of PreTeXt.
3. Have a working GitHub Codespaces environment to suitable for authoring and editing in PreTeXt.

2.1 Setting up Codespaces

A **Codespace** is an authoring environment that lives in the "cloud", that is, a virtual machine hosted by GitHub that has all of the software needed to create great accessible documents, accessible with just a web browser.

This coding environment uses a web version of Virtual Studio Code, an open-source editor, along with the PreTeXt community's custom plugins and software to get started authoring quickly.

Follow the instructions at `https://github.com/PreTeXtBook/pretext-codespace` to get started. Let this run for a few minutes in the background while you review the rest of this section.

2.2 PreTeXt Principles

A more detailed monograph on PreTeXt's philosophy[1] is availabe in the PreTeXt Guide.

List 2.2.1 PreTeXt Principles

1. PreTeXt is a markup language that captures the structure of textbooks and research papers.
2. PreTeXt is human-readable and human-writable.
3. PreTeXt documents serve as a single source which can be easily converted to multiple other formats, current and future.

[1] `pretextbook.org/doc/guide/html/philosophy.html`

4. PreTeXt respects the good design practices which have been developed over the past centuries.
5. PreTeXt makes it easy for authors to implement features which are both common and reasonable.
6. PreTeXt supports online documents which make use of the full capabilities of the Web.
7. PreTeXt output is styled by selecting from a list of available templates, relieving the author of the burden involved in micromanaging the output format.
8. PreTeXt is free: the software is available at no cost, with an open license. The use of PreTeXt does not impose any constraints on documents prepared with the system.
9. PreTeXt is not a closed system: documents can be converted to LaTeX and then developed using standard LaTeX tools.
10. PreTeXt recognizes that scholarly documents involve the interaction of authors, publishers, scholars, curators, instructors, students, and readers, with each group having its own needs and goals.
11. PreTeXt recognizes the inherent value in producing material that is accessible to everyone.

2.3 PreTeXt is XML

Since PreTeXt uses the XML markup language, all content is structured in terms of **elements**. The root `pretext` element nests many other elements inside of it. This is accomplished by surrounding everything with a starting **`<pretext>` tag** and an ending `</pretext>` tag. (Folks with HTML experience will find this pattern familiar, akin to the "HTML" root element.)

Listing 2.3.1 is a very simple PreTeXt/XML document. (The first line is boilerplate that lets various programs know the rest of the file is XML, and the third-to-last line is an example of a comment that won't appear in the output.)

```
<?xml version="1.0" encoding="UTF-8"?>
<pretext>
    <article>
        <title>Hello world!</title>
        <p>Welcome to PreTeXt!</p>
        <!-- TODO: find something more to say... -->
    </article>
</pretext>
```

Listing 2.3.1 Source of a simple PreTeXt book project.

2.4 Books and Divisions

There are several documents you can write in PreTeXt, such as `<article>`s and `<slideshow>`s. This tutorial will focus on `<book>`s.

A `<book>` typically includes `<frontmatter>`, and `<backmatter>`.

Between <frontmatter>, and <backmatter> are either several <chapter>s or <part>s. If used, <part>s are subdivided into <chapter>s. Then <chapter>s subdivide into <section>s, and <section>s can have <subsection>s.

Each of these subdivisions needs a <title>, and may have an <introduction> or <conclusion>.

Listing 2.4.1 puts some of these elements together for a simple PreTeXt project (information on the other elements will come in later sections).

```
<?xml version="1.0" encoding="UTF-8"?>
<pretext xml:lang="en-US">
  <!-- (author configurations go in docinfo) -->
  <docinfo>
    <macros>
      \newcommand{\R}{\mathbb R}
    </macros>
  </docinfo>


  <book xml:id="my-great-book">
    <title>My Great Book</title>
    <subtitle>An example to get you started</subtitle>

    <frontmatter xml:id="frontmatter">
      <titlepage>
        <author>
          <personname>You</personname>
          <department>Your department</department>
          <institution>Your institution</institution>
        </author>
        <date>
          <today />
        </date>
      </titlepage>
    </frontmatter>

    <chapter xml:id="chapter-welcome">
      <title>Welcome!</title>
      <introduction>
        <p>This chapter is about the real numbers
            <m>\R</m></p>
      </introduction>

      <section xml:id="section-getting-started">
        <title>Let's get started</title>
        <p>Can you solve <m>ax^2+bx+c=0</m>?</p>
      </section>

      <section xml:id="section-learning-more">
        <title>But wait, there's more!</title>
        <p>Did you know that
            <me>x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}</me>?</p>
      </section>

    </chapter>

    <backmatter xml:id="backmatter">
      <title>Backmatter</title>

      <colophon>
        <p> This book was authored in <pretext />. </p>
      </colophon>

    </backmatter>

  </book>

</pretext>
```

Listing 2.4.1 Source of a simple PreTeXt book project.

2.5 Paragraphs, Lists, and Blocks

Within each division (chapter, section, etc., see Section 2.4) of your book, you likely want some content (e.g. what you're reading right now!).

Written content is usually structured as **paragraphs**, `<p>` for short. If you've ever written HTML, this tag may be familiar to you, but be warned: while PreTeXt is XML (Section 2.3), *PreTeXt is not HTML*! There is some overlap: you can *emphasize* words or phrases with `<em>` for instance. However, while HTML uses the full word "code" for its tag, PreTeXt uses the shortened `<c>` tag.

Note that these elements are all **semantic**: they express the *meaning* of content, not its presentation. For example, the word "semantic" was a `<term>`, we just defined, while we merely emphasized "meaning" with `<em>`. The presentation of these concepts may vary by output format, likely using some combination of boldface, italics, or underlining.

Heads up! We'll talk about customizing presentation later, but it's important to remember that the PreTeXt community separates such "publication" decisions away from the work of "authoring" content.

For users coming from LaTeX, rest assured your mathematical formulas work in PreTeXt. Inline mathmode $ax^2+bx+c=0$ is invoked with `<m>ax^2+bx+c=0</m>`, while display mathematics like

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

is available via `<me>x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}</me>`. (Users from LaTeX will also appreciate that quotes are surrounded with `<q>` in PreTeXt to handle the different way quotation marks are handled in LaTeX vs most other markup languages.)

You may also have lists withinn paragraphs, ordered `<ol>` and unordered `<ul>`, nested as needed. Each list item is represented by `<li>`.

- A single item.
- An item with an ordered list.
    1. First item.
    2. Second item.

Of course, often you have important **blocks** of content to include, such as `<definition>`s or `<claim>`s.

Definition 2.5.1 PreTeXt is an uncomplicated XML language for describing scholarly documents. ◊

Claim 2.5.2 *PreTeXt is the language that will replace LaTeX for authors.*

Proof. Left to the reader. ■

Such content is automatically numbered appropriately. Each of the blocks above is structured with a `<statement>`, and Claim 2.5.2 additionally features a `<proof>`.

Content is often "knowled". A **knowl** is a piece of context-independent information that is useful to transclude elsewhere in the HTML build of your document. For example, in the HTML build for this document, the above proof is knowled by default, and clicking the referenced "Claim" in the previous paragraph expands its knowl to reveal the claim for the reader.