LIBRETEXTS CONSTRUCTION GUIDE



Delmar Larsen
Libretexts



LibreTexts Construction Guide

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Licensing

*A detailed breakdown of this resource's licensing can be found in **Back Matter/Detailed Licensing**.*

CHAPTER OVERVIEW

1: LibreTexts Fundamentals

The goal of the LibreTexts project is to establish a vetted, comprehensive, and widely-used platform for the dissemination and implementation of customized course materials for post-secondary courses, while significantly reducing existing textbook costs for students. The LibreTexts project consists of 13 independently operating and interconnected “libraries” that focus on augmenting education in separate fields via a series of open-access online textbook environments that includes complementary ancillaries that advance diverse pedagogical methods and support multiple student learning styles. The LibreTexts libraries currently benefits over 100 million students per year and is arguably the most visited chemistry website in the world.

1.1: Project Overview
1.2: Project Organization
1.3: Orientation
1.4: Course Shell Checklist
1.5: Workshop Skills Checklist

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1.1: Project Overview

LibreTexts is a collaborative effort to improve education for students, especially economically-disadvantaged students, by constructing and distributing open-access online LibreTexts libraries. The project includes complementary ancillaries that advance a number of different pedagogical methods. It supports a highly diverse student population previously exposed to a broad range of learning experiences and with major differences in their skill levels, preparation, and background. In addition to providing up-to-date, peer-reviewed, affordable, and convenient content. LibreTexts, as a Next-generation learning system, promotes personalized, flexible, and interactive learning experiences. From these components, we will have a combined assessment infrastructure that tracks and correlates individual performance with simulations, homework activities, and exam performance with a goal of identifying and tracking student strengths and weakness to determine how best to amplify learning across multiple curricula. This is enabled by broad scope vertical and horizontal nature of the LibreTexts.

The success of the LibreTexts Project positively impacts four main populations in substantial ways: (1) Availability of free quality resources for learning by the non-academic community; (2) Reducing the financial burden on all students, especially lower socioeconomic status students, while simultaneously addressing any identified lack of preparation; (3) Smaller or financially disadvantaged academic institutions, including high schools, that increasingly wish to adopt newer learning technologies but cannot afford the initial buy-in to change curriculum; and (4) Discipline-based education researchers looking for a platform to evaluate interdisciplinary approaches and curriculum modifications that would otherwise cost too much to develop from scratch. For broader impacts, we propose will take advantage of the LibreTexts extensive dissemination network to provide equal education opportunities to students with limited English proficiency by expanding the libraries into Spanish language translations.

Traditional publishing of a textbook involves preparing a typeset manuscript for a commercial publisher, who binds it and distributes it, often at prices that make it inaccessible to students from less affluent institutions. However, online texts are superior to a paper text in several ways:

1. Web browsers can jump to the page you click on, so even an 800 page book can be read in real time.
2. The equations, sections, references and index cross-referencing can be hyperlinked, so students can effortlessly jump back and forth through the text.
3. Traditionally, there are conflicts between conciseness (i.e., important ideas get across within reasonable reading time) and scholarly completeness. Online texts allow for branching into levels of detail suited to individual reader's interests, and providing up-to-date links to other relevant material.
4. It is often more instructive to work through a solution of a problem than be given only the abstract theory. Online texts helps by providing links to student projects and problem solutions.

It is possible to have LibreTexts books printed by print-on-demand companies (both Amazon and LuluExpress output files are generated). A complete book takes often years to produce; however, the LibreTexts platform makes it possible to make accessible the (semi)completed parts as textbook construction proceeds. The LibreTexts project adopts an open construction approach since we strongly believe that is better to have educational content accessible to students and then continuously improve it, rather than refusing to share until the building and perfecting is completed.

Content on LibreTexts is either constructed from scratch or harvested from existing OER content, but most of it is integrated from existing content scattered across the internet. Content stored on individual faculty's websites, hidden in pdfs, or published has been integrated into the LibreTexts format, all with the original author's permission to publish the content under a free license that aligns with the free and accessible philosophy of the LibreTexts. Central to its success is the construction and adoption of faculty specific and freely accessible "LibreTexts" that substitute for costly conventional textbooks in post-secondary courses. These are assembled by incorporating content from an extensive network of existing chemistry and broader materials. We recently hosted a YouTube webinar to explain our project and scope:



Video 1.1.1*:* www.youtube.com/watch?v=sxLmeHMgvTg

The Construction guide aids developers in interacting with the LibreTexts platform and building content. To complement these resources, there is a Construction Forum for developers to help each other, which is freely available (however, a free account is needed to post) (groups.io/g/Libretexts-ConstructionForum/topics):

LibreVerse

The LibreTexts Libraries are part of a great "LibreVerse" of interconnected technologies to advance the development and usage of the textbook of the future. Many aspects of this greater LibreVerse will be introduced in this Construction Guide.



Figure 1.1.1: *General overview of the LibreVerse*

Supporting the libraries are a number of components (most require instructor accounts to access and are unlinked below)

- **ADAPT** – LibreTexts' new homework system with integrated problem sets.
- **Analytics** - Linked to the Adapt homework system, LibreTexts' Analytics have been designed by instructors for their students.
- **Studio** – LibreTexts' H5P app for building questions that can be inserted into your LibreTexts.
- **Nova** - Drupal based FOSS tech allows local hosting of LibreTexts' with native H5P, QTI and other courseware features.
- **Commons** – LibreTexts' window on the world, access to Catalog, Libraries and Collections. Every LibreNet member has their own branded Campus Commons.
- **Conductor** – LibreTexts' team oriented project management software coordinates book construction and curation.
- **Composer** – LibreTexts' drag and drop remixer for books. LibreTexts' editor provides paragraph level attribution, automatic numbering of equations and more.
- **Curator** – LibreTexts' format allows centralized, automatic curation flagging common problems including lack of alt text, linkrot and more.

- **Jupyter Hubs** - provides an environment where you can create interactive notebooks with code, visualizations, and more.
- **Support Center** - Contact the LibreTexts Support Team for help, and explore featured insight articles and videos curated by the LibreTexts team.

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1.2: Project Organization

The LibreTexts consists of 12 field-specific libraries, a K-12 library (available in English) and a Spanish (Español) library. Table 1.2.1 lists the libraries and the URLs for reaching them directly:

Table 1.2.1: LibreTexts Libraries

Library	URL
Biology	https://bio.libretexts.org/
Business	https://biz.libretexts.org/
Chemistry	https://chem.libretexts.org/
Engineering	https://eng.libretexts.org/
Español	https://espanol.libretexts.org/
Geosciences	https://geo.libretexts.org/
Global	https://query.libretexts.org/
Humanities	https://human.libretexts.org/
K12 Edducation	https://K12.libretexts.org/
Mathematics	https://math.libretexts.org/
Medicine (Human Health)	https://med.libretexts.org/
Physics	https://phys.libretexts.org/
Social Sciences	https://socialsci.libretexts.org/
Statistics	https://stats.libretexts.org/
Ukrayinska	https://ukrayinska.libretexts.org/
Workforce	https://workforce.libretexts.org/

There are several other ways of reaching the library of your choice which we will describe on the next page

With the exception of the K-12 and Español, Global and Ukrayinska libraries, the content is organized in three primary sections: the Campus Bookshelves, the **Bookshelves** and **Learning Objects**. The Español, Global and Ukrayinska libraries contain machine translations of books found in the Bookshelves areas.

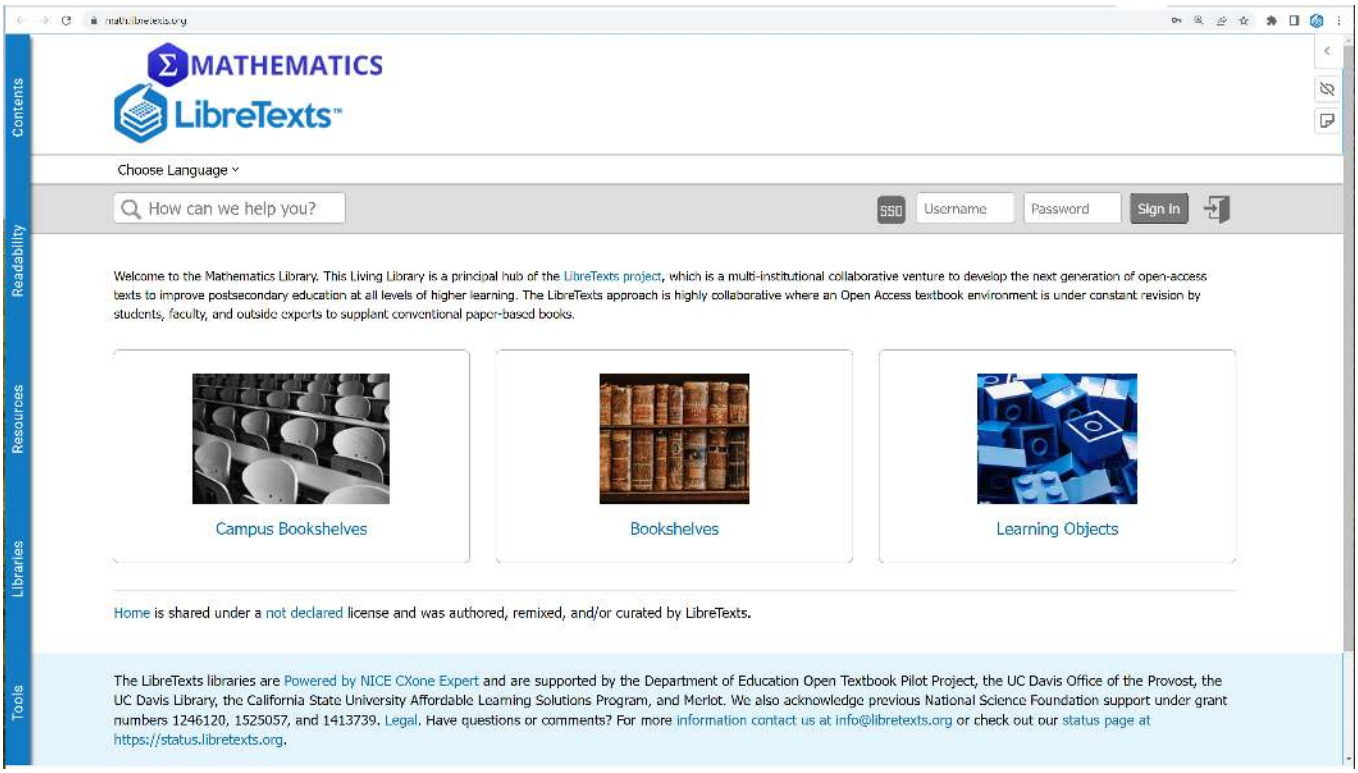


Figure 1.2.1: Top-level organization of the *Mathematics Library* with the three primary categories shown.

Campus Bookshelves

The content in the Campus Bookshelves is formulated as *campus-dependent and faculty-dependent* course shells with customized textbook remixes. These textbooks are customized by faculty, often in collaboration with developers on the LibreTexts team and may include content from any other sections of the LibreTexts libraries (both within and outside of the respective library where it resides).

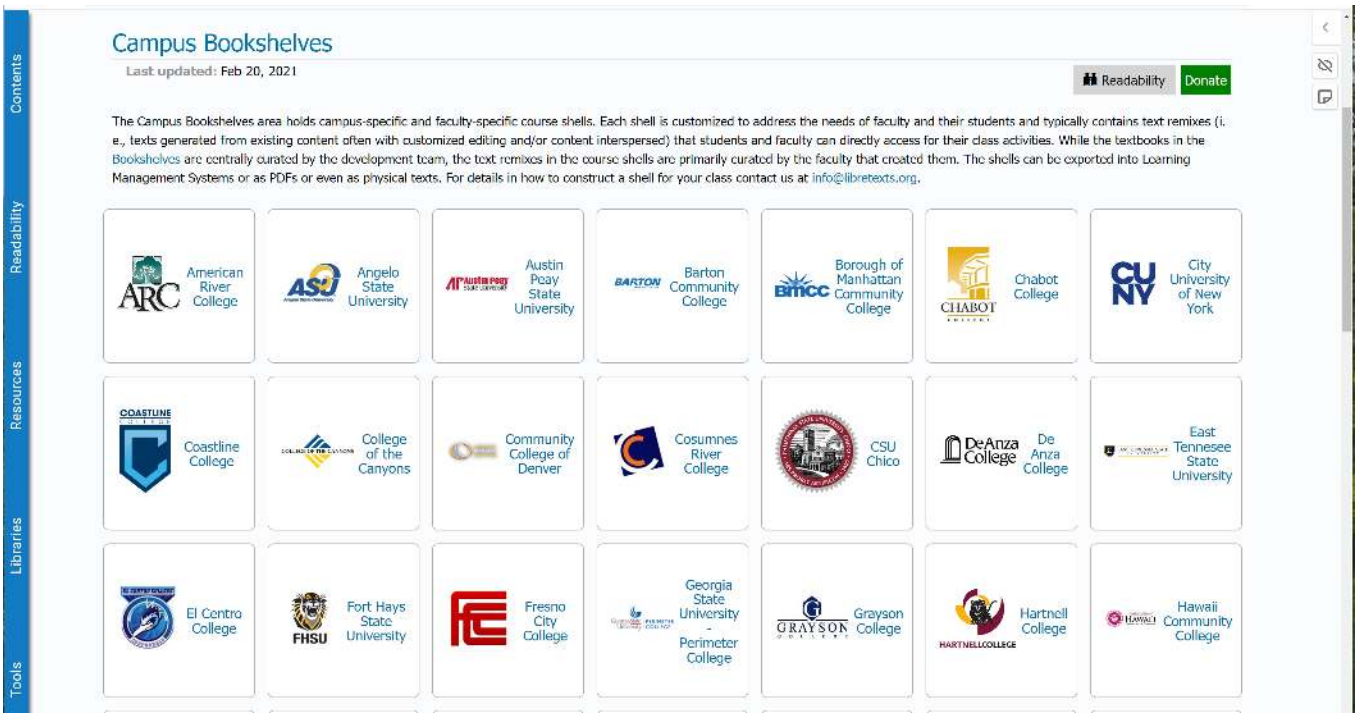


Figure 1.2.2: Several campus sandboxes in the primary Course section of the *Mathematics Library.*

For the student, the Course shell is the “decoder” to the 100,000 pages of content in the libraries. While the texts in the Bookshelves are curated by the LibreTexts team and the greater LibreTexts community, the content in the Course Shells are intended to be curated by the faculty and campuses that "own" them. The full freedom to customize Course Shells enables faculty to construct Textbooks and Shells as they see fit. For example, the Chem 2BH course Shell at UCD includes much more than a simple textbook; it also includes an Agenda, homework assignments, worksheets, and the laboratory manual.

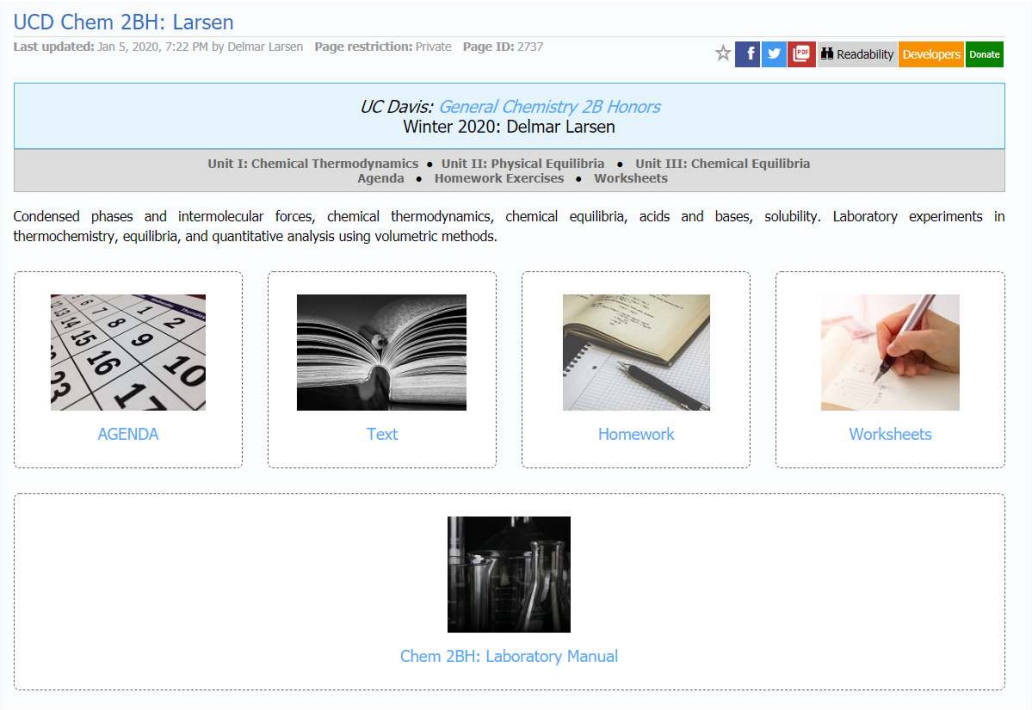


Figure 1.2.3: An example Course shells (Chemistry 2BH at UC Davis) more resembles a Learn Management System shell than a conventional textbook.

Bookshelves

This is where the LibreTexts books are stored. Instructors can either use these texts as constructed or they can use the OER Remixer to modify these materials and create a remix text that is customized for their course.

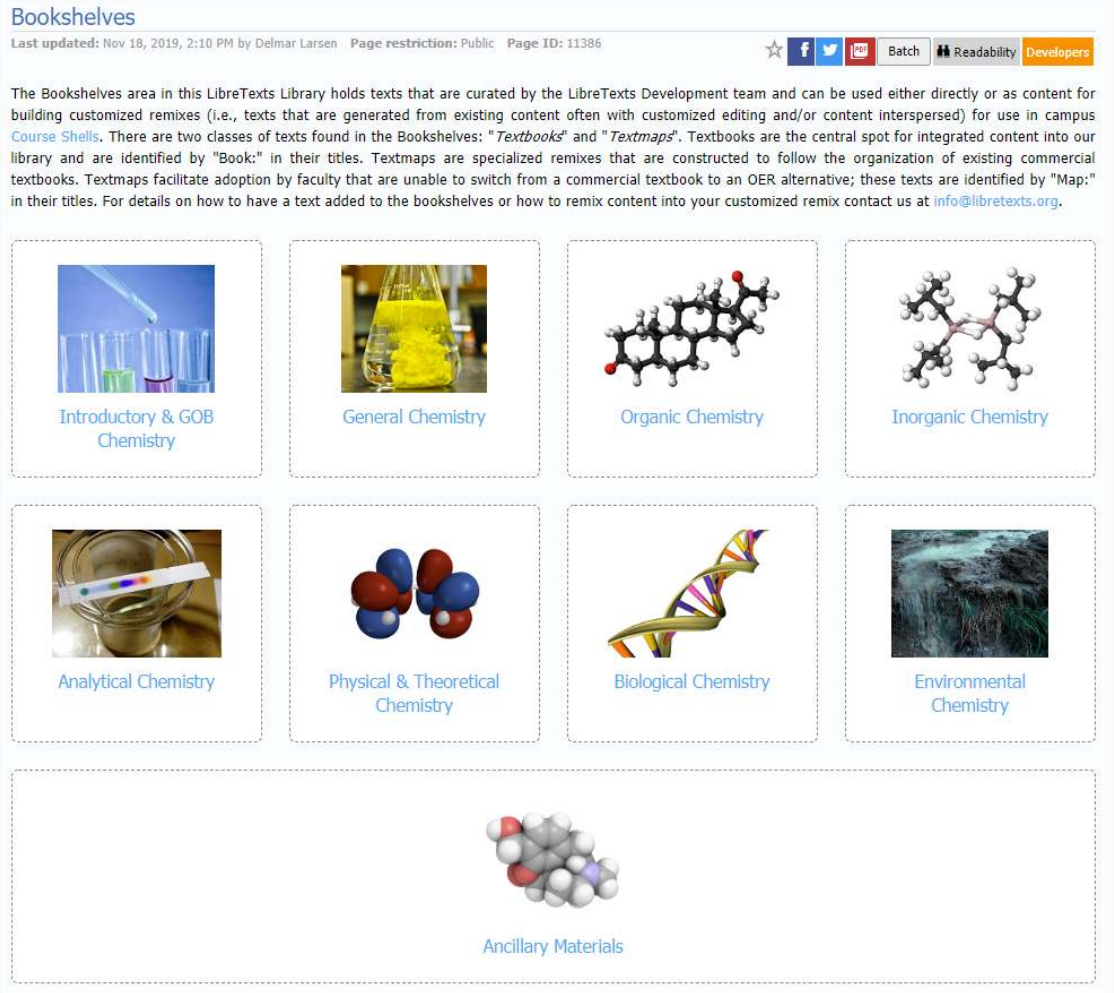


Figure 1.2.4: Organization of the Bookshelves in the *Chemistry Library* is based on the sub-fields of the library.

Textbooks vs. Textmaps

Some of the texts in the Bookshelves are titled "Book:" and some "Map:". The "books" are original OER textbooks that have been created by LibreTexts, or integrated into the LibreTexts (e.g., texts from OpenStax or the Open Textbook Library referatory). The content in these Books are largely original, although often heavily edited by editors to conform to project standards on presentation and error correction. Alternatively, "Maps" are remixes that are constructed and organized around existing commercial textbooks, but using existing OER content with light or heavy filling in of gaps in the library. The principal goal of the TextMaps is to provide an easy-to-adopt alternative to faculty's existing textbook choices. Faculty that are too invested in commercial texts to switch to a new organization can adopt a Map.

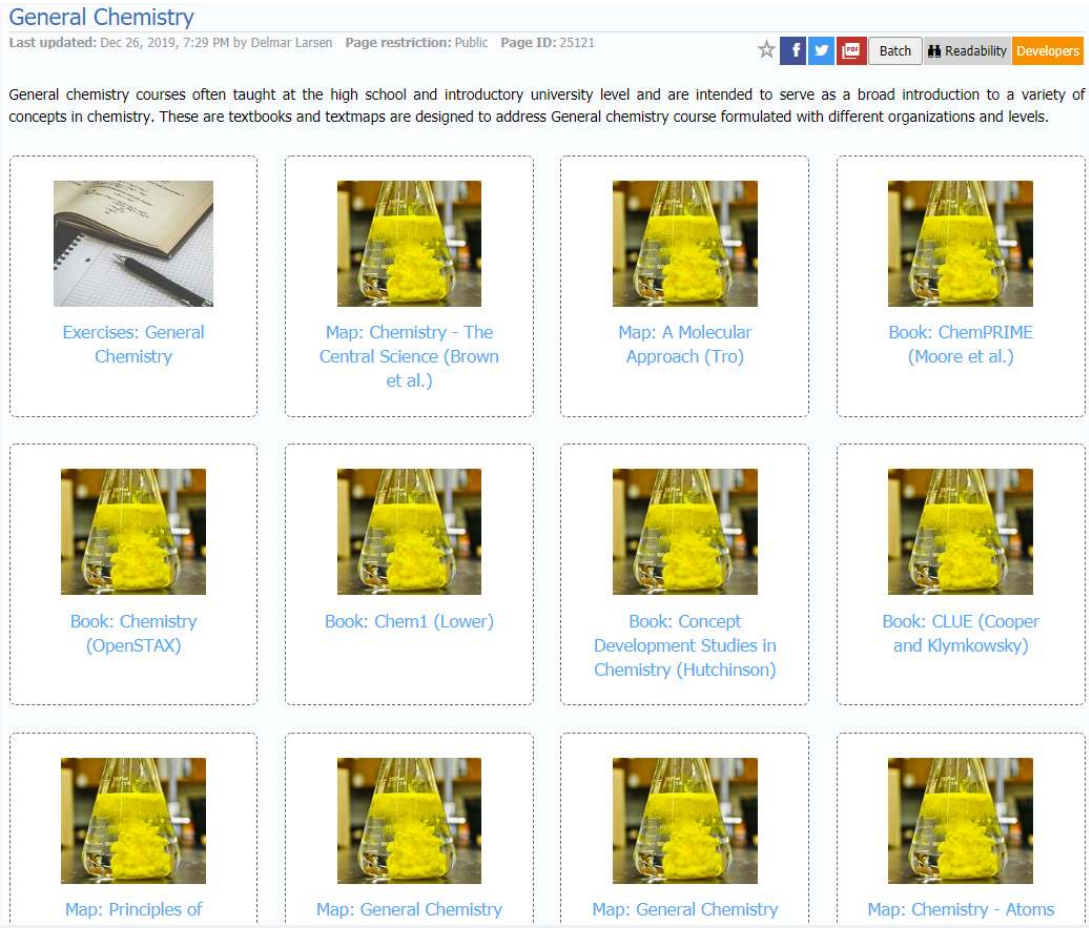


Figure 1.2.5: Example of a Textmaps and Textbooks in the General Chemistry section of the Bookshelves of the *Chemistry Library*. Note differences in the titles.

Learning Objects

These secondary sections contain all materials other than books and homework. The content in this section varies from library to library and may include:

- *Worksheets*: The LibreTexts worksheets are documents with questions or exercises for students to complete and record answers and are intended to help a student become proficient in a particular skill that was taught to them in class.
- *Exemplars and Case Studies*: Exemplars are subject-specific examples that illustrate specific concepts. Students can choose from a wide variety of "exemplars"—subject-specific examples that illustrate each concept. Exemplars are arranged in "tracks" that run through the entire course. One track contains most of the topics and concepts included in a typical general chemistry course; topics are arranged by headings similar to textbook chapter titles and subheadings similar to textbook chapter sections.
- *Visualization*: These are interactive web-based tutorials and simulations that take advantage of the computational resources of an online resource. This involves other active feedback simulations, including virtual laboratories, tutorials, and real-time concept tests.
- *References*: Tables of constants typically found in textbook appendices or reference books are found in this section.
- *Laboratories Experiments and Demonstrations*: These are traditional experimental write-ups and demonstrations to increase student attention and engagement in class.

Homework Exercises Sections

These secondary sections are where we organize homework exercises and solutions. A "Faculty Only" section may exist that is accessible to faculty only for use in homework and exams. The homework infrastructure is being migrated to a new server (https://adapt.libretexts.org) that will be available soon. A studio for creating H5P questions is also available (https://studio.libretexts.org).

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1.3: Orientation

Rather than going directly to a library or a book using the URL, one can use the LibreTexts Commons (https://commons.libretexts.org/libraries)

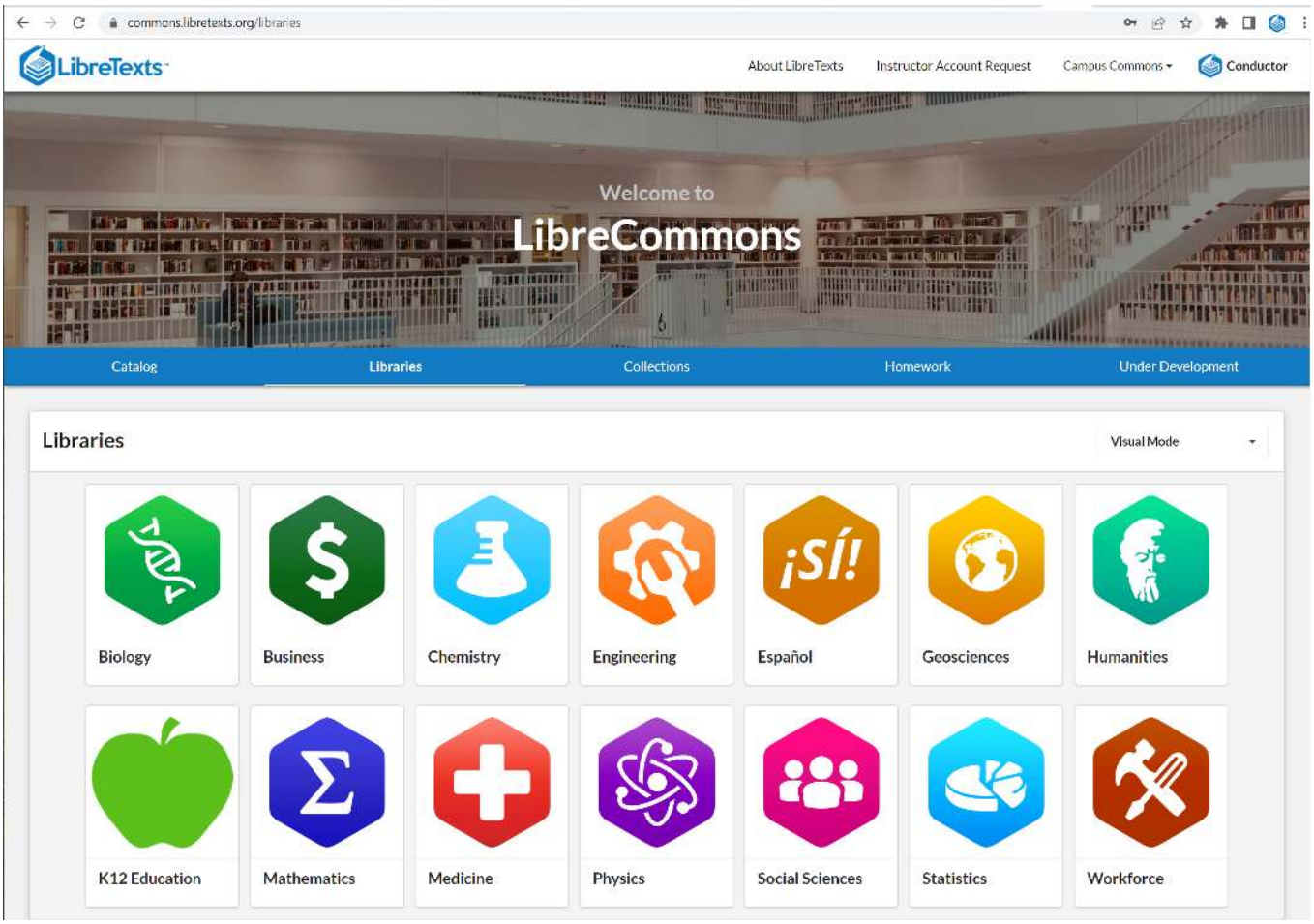


Figure 1.3.1: Access to the 14 libraries from LibreTexts Commons

After clicking on the Library of your choice, you can select either the front page of the library or one of the sub-divisions

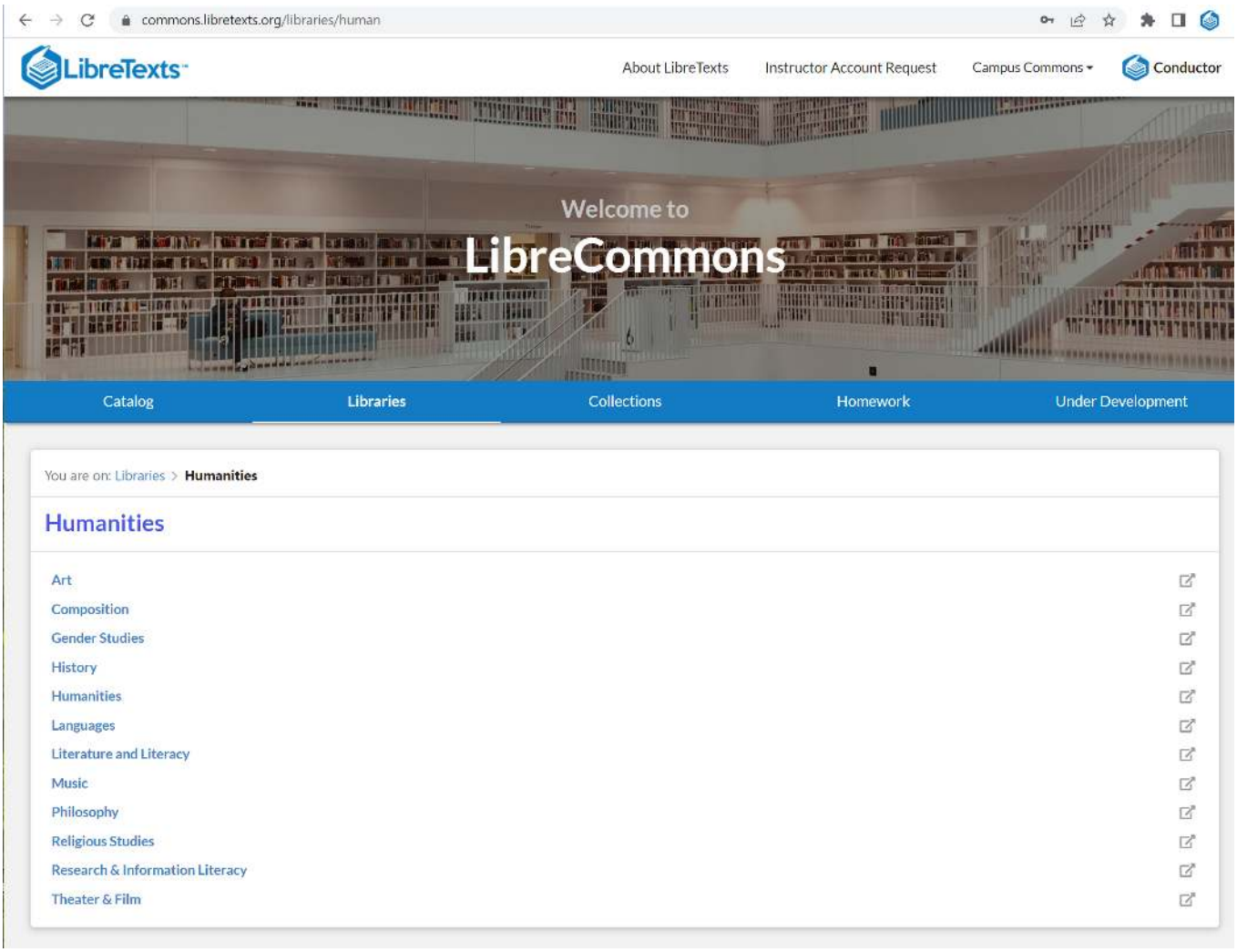


Figure 1.3.2: One can go either to the front page of the Library by clicking on its name or to one of the sublibraries

Navagating in a Library

Having selected a library one comes to the front page

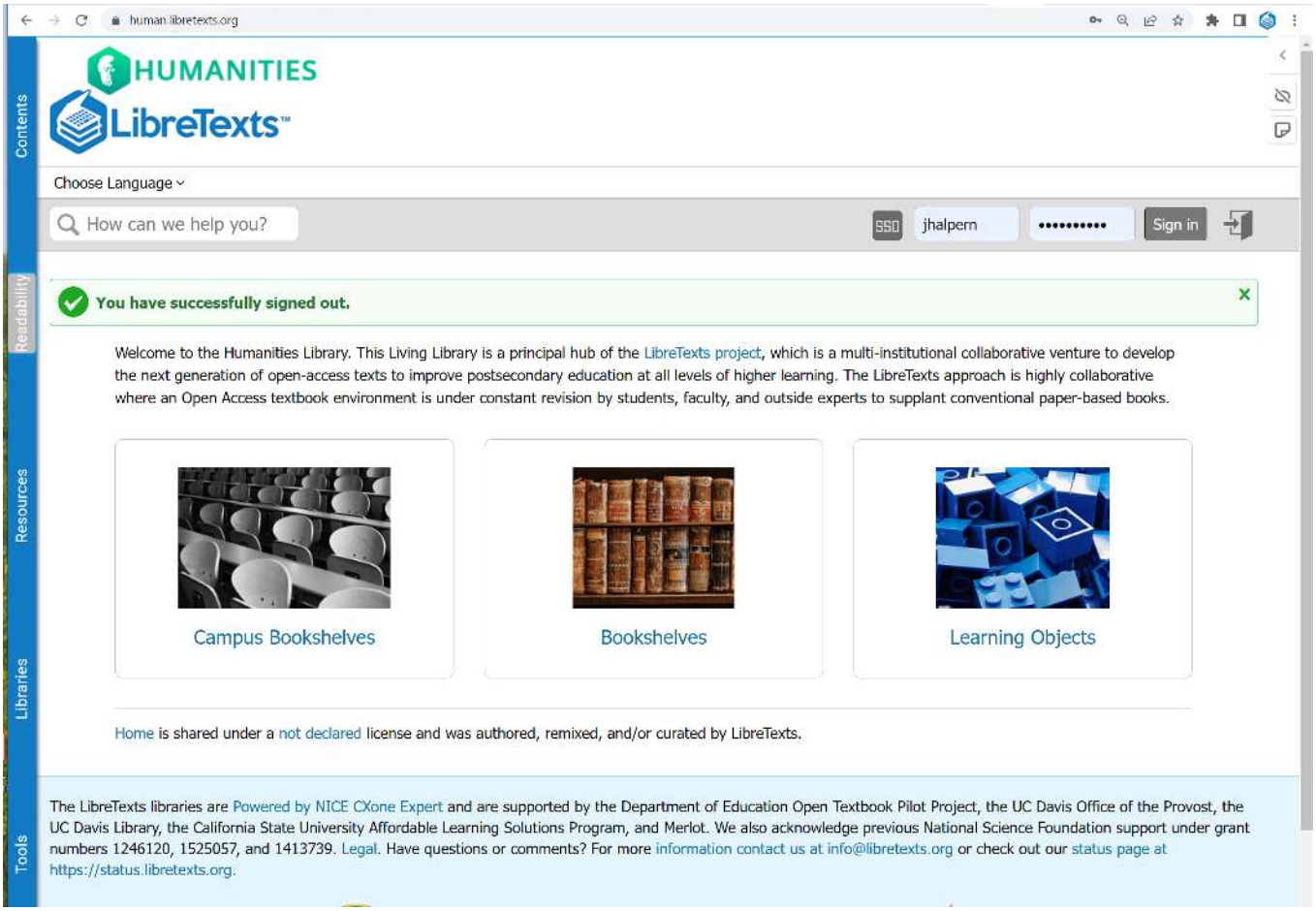


Figure 1.3.3: Front page of the humanities library. Note the blue bar on the far left

Although one can drill down to find any text in the library and any page in the texts by clicking on the appropriate boxes, the blue bar makes navigation much easier. Clicking on contents leads one to an expandable menu from which one can navigate to any book, chapter or page.

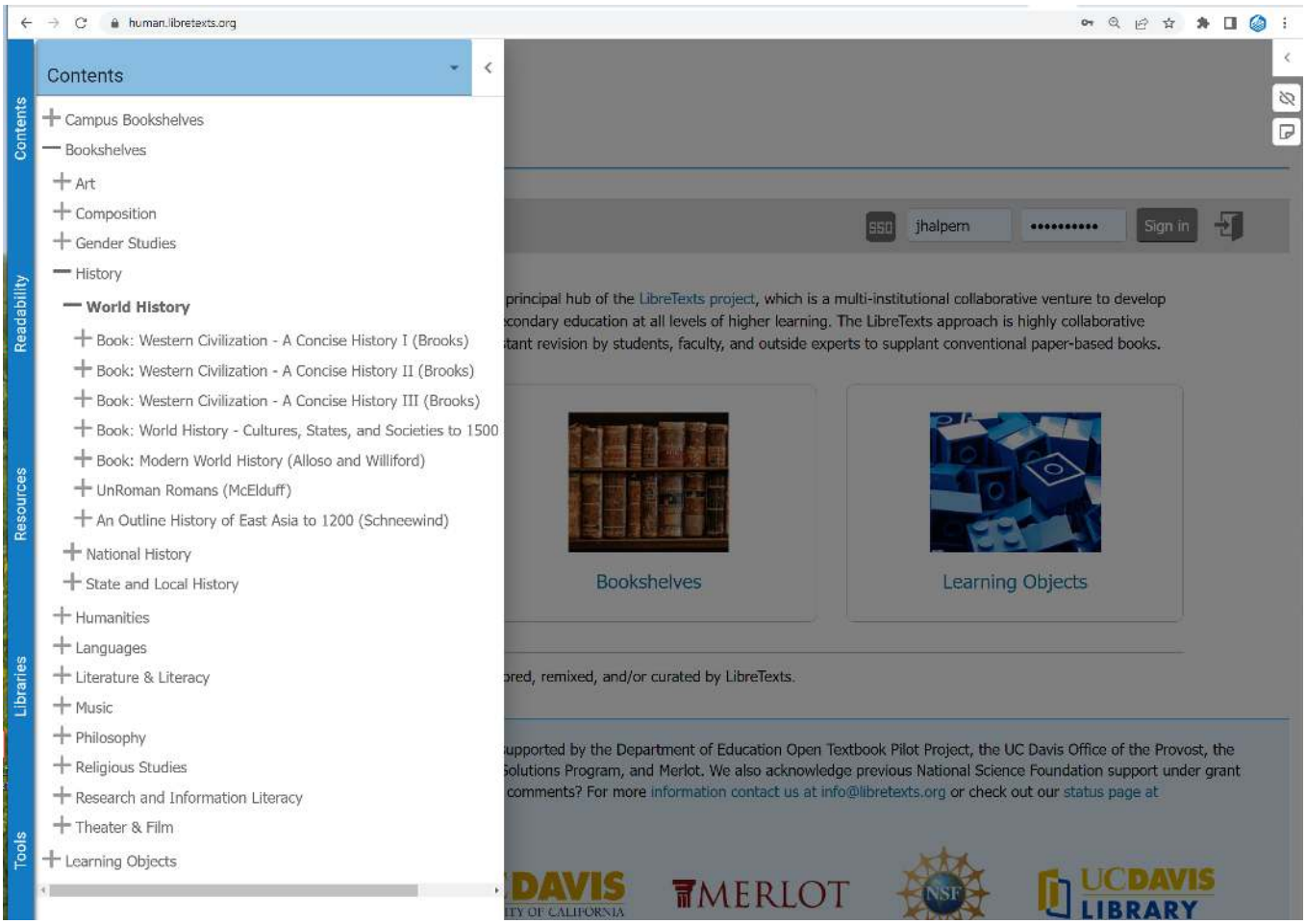


Figure 1.3.4: Clicking on the Contents tab in the Blue Bar allows straightforward navigation to any book, chapter or page

The Readabiity menu allows setting text size, margin size and color scheme. The BeeLine Reader assists those with difficulty reading by providing an eye guiding color gradient to pull your eyes through long blocks of text.

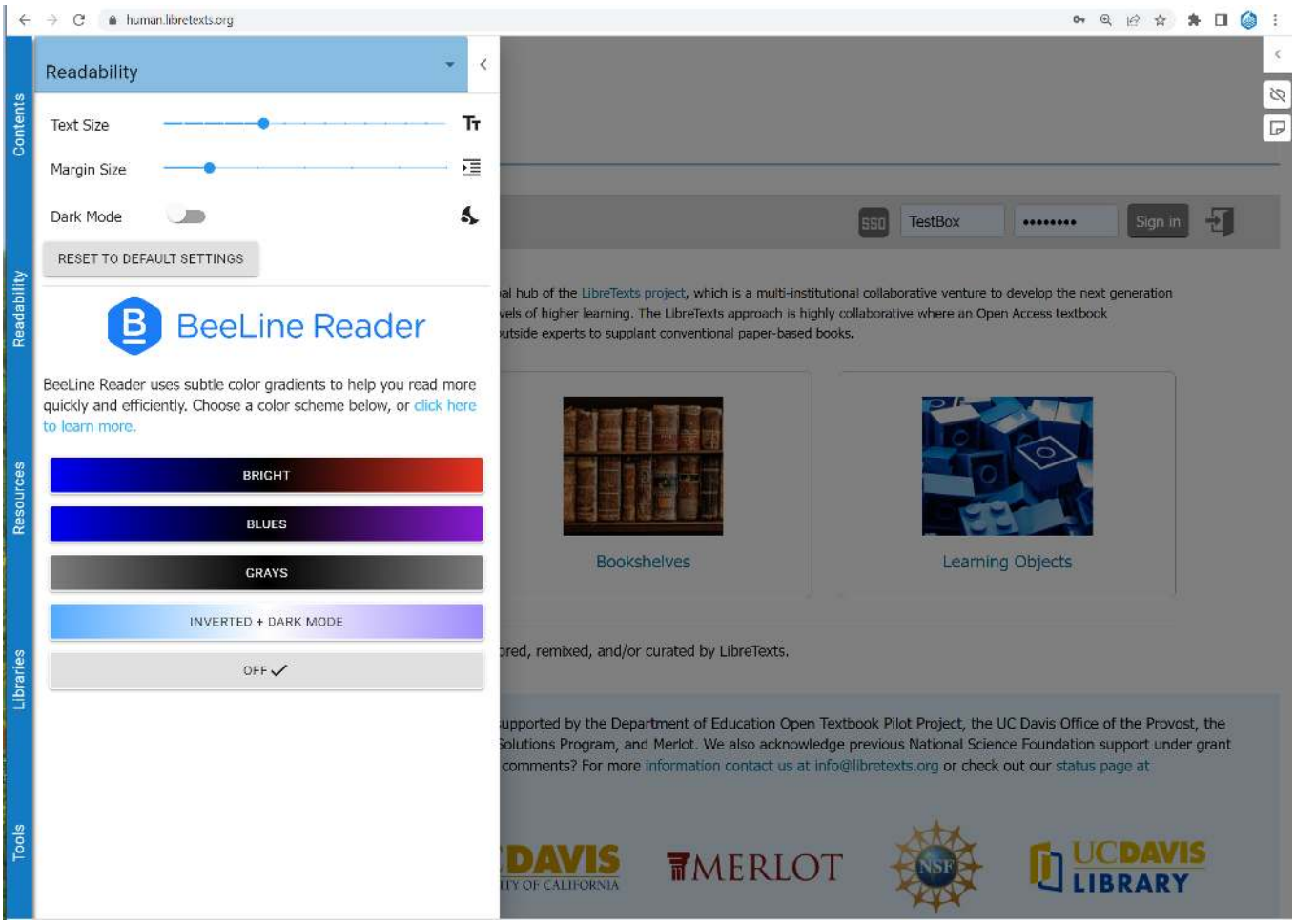


Figure 1.3.5: The Readability tab has tools to improve readability by contolling text, margin and color schemes

The Resources Tab gives access to tools that readers can use during study. This tab is underdevelopment for some libraries

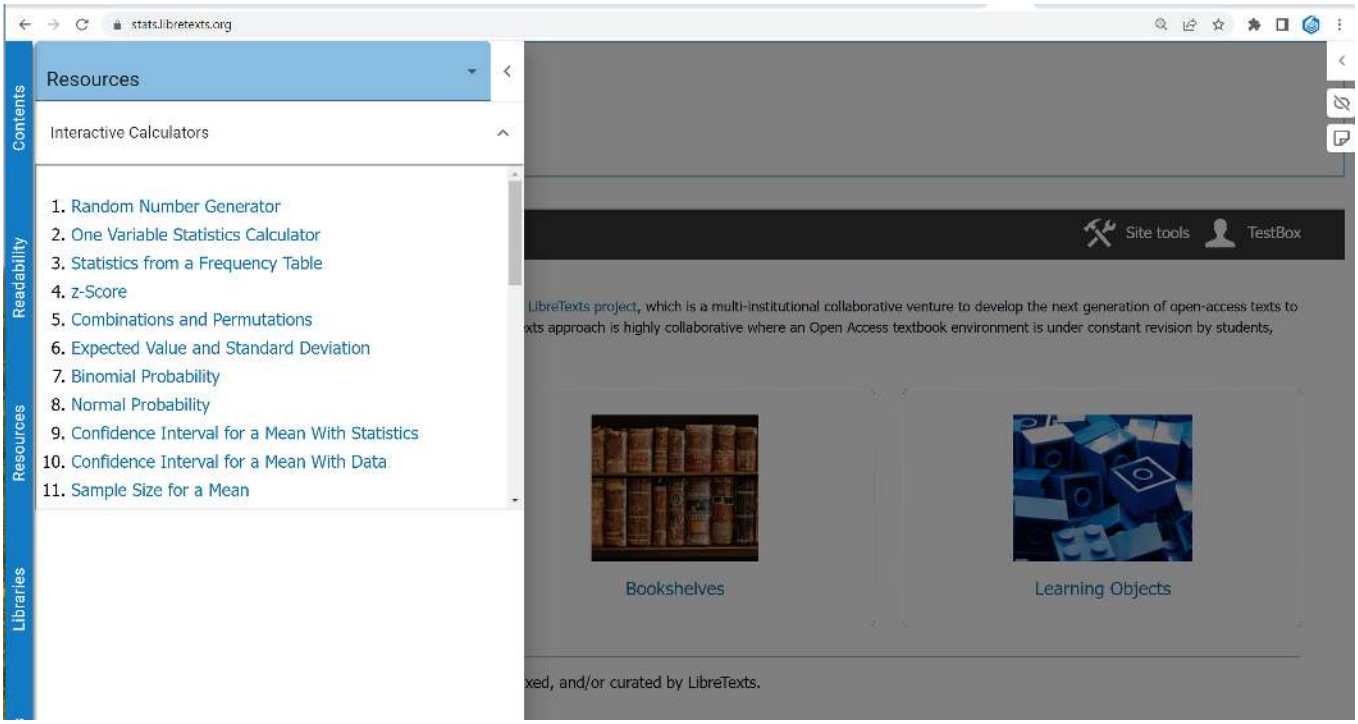


Figure 1.3.6: Copy and Paste Caption here. (Copyright; author via source)

The Libraries tab provides direct access to any of the Libraries and sub-Libraries

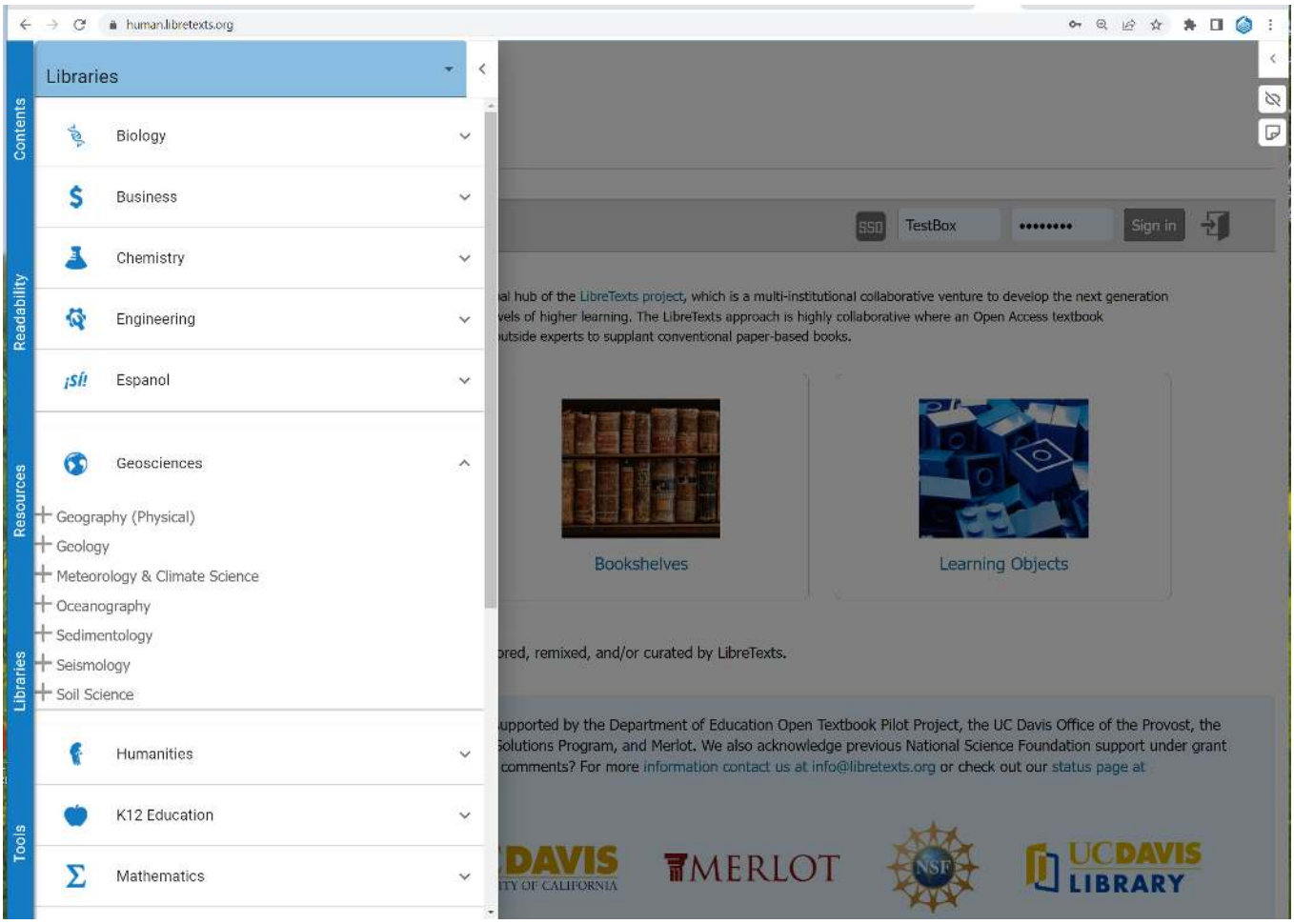


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Now if we move off to a LibreTexts book, there are some changes to note. First a light blue bar has appeared under the gray sign in bar. This shows where you are, having started from the Stats Library front page, selected the Campus Bookshelves, then the CUNY area, and finally the book, Introductory Statistics with Probability. You can rapidly move up the hierarchy by clicking on any of these. The three lines at the left hand end of the bar are a tab which will pull down the same selection menu as the Contents tab on the far left blue bar.

The red, blue, grey, green bar at the far right also provides some important functions. the pdf button will print whatever selection (book, chapter, page) you are in. The Downloads button provides access to LibreTexts' Bookstore where you can buy a printed copy of the book using Lulu.com, a just in time printer, download the Common Cartridge for linking the chapters in the book to your LMS, and several options for generating and printing pdf files. Readability is the same as the Readability tab on the far left blue bar. Donate, well, go ahead, please do.

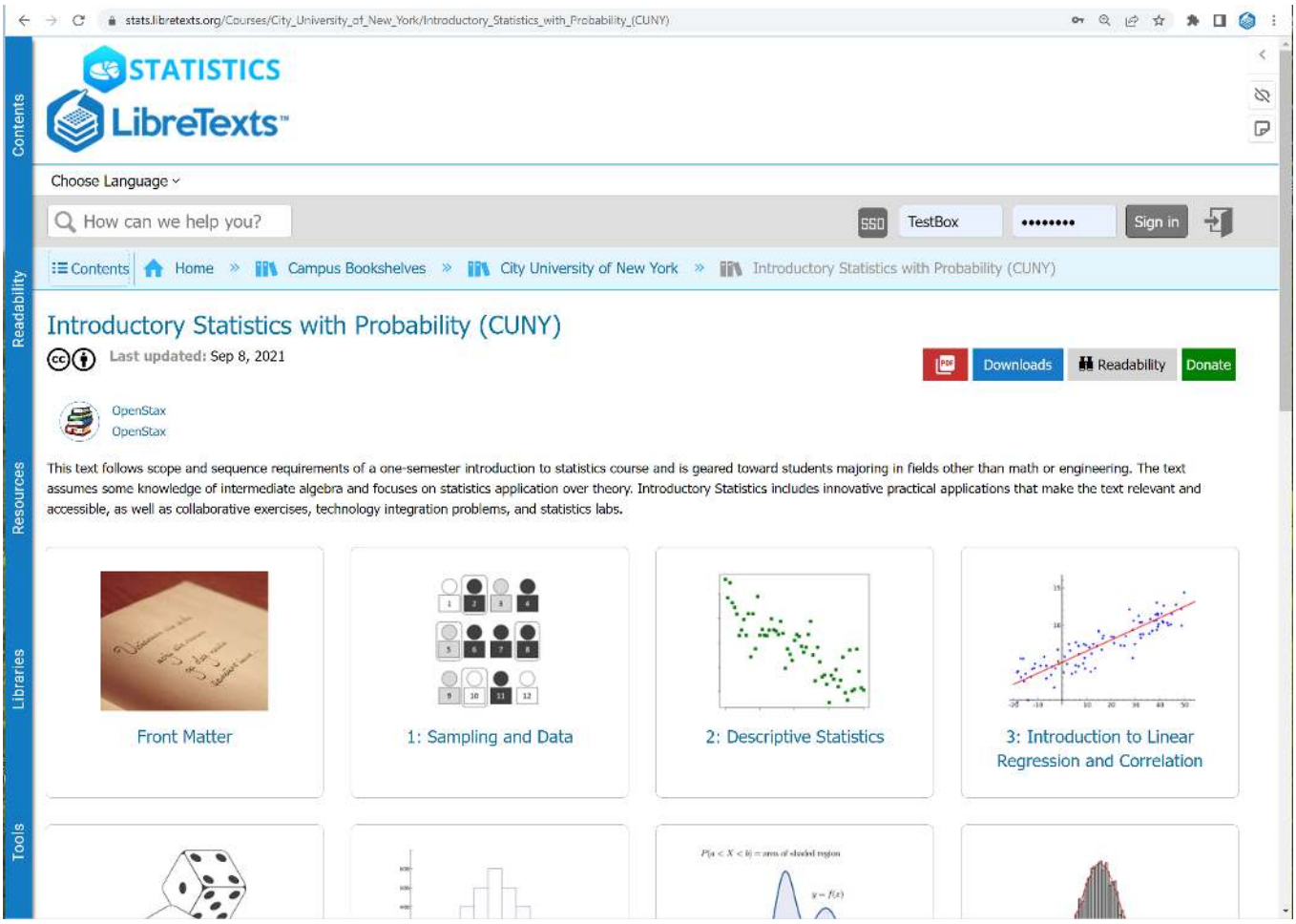


Figure 1.3.1: Copy and Paste Caption here. (Copyright; author via source)

The three symbols at the top right corner, above sign in, invoke Hypothes.is. If you drag select text on a page, a popup will ask you if you want to show them as highlights or annotate the selection. If you have established a free account at Hypothesis, and logged into it (the top button with the <)the system will remember the next time you login

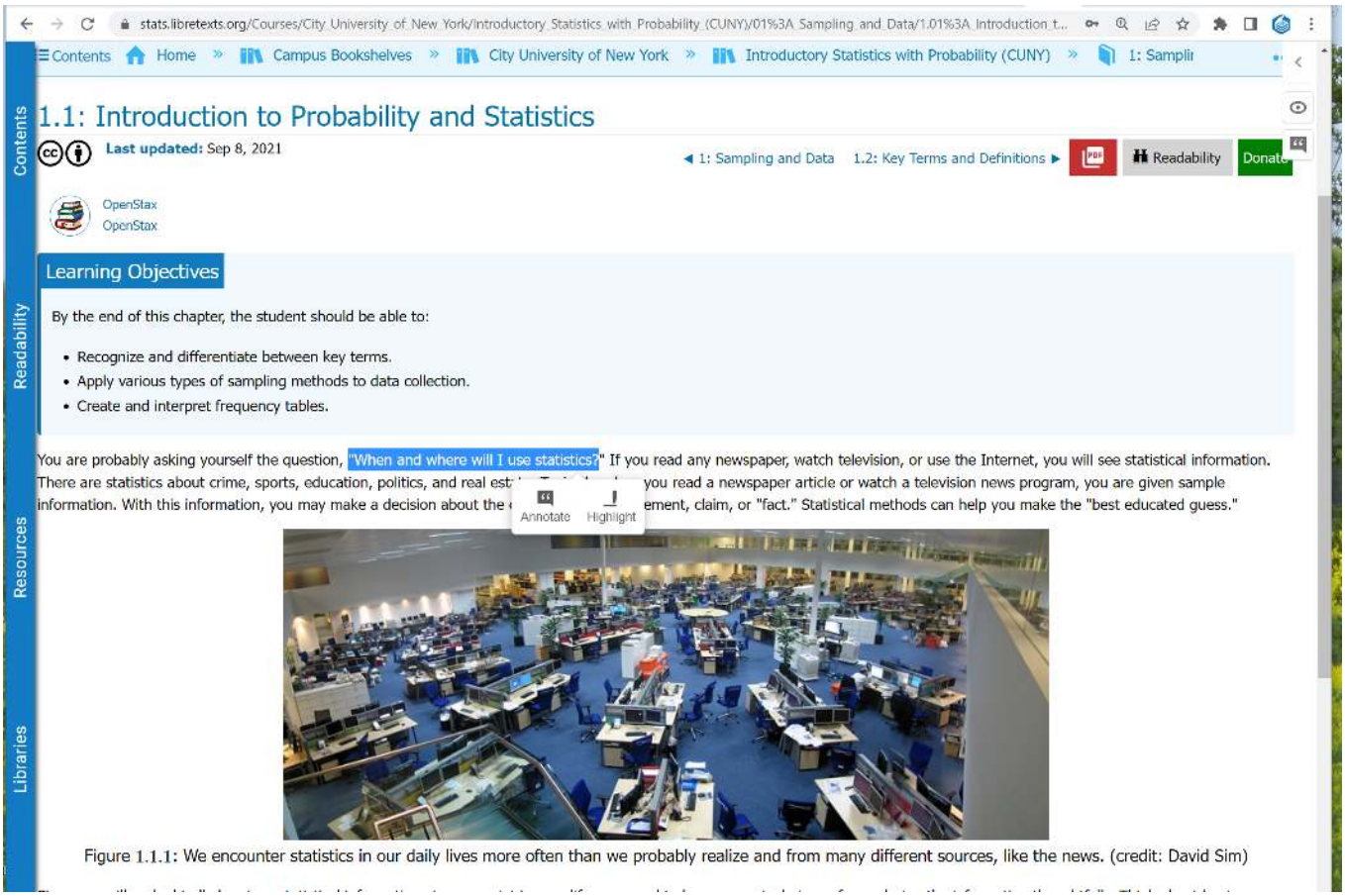


Figure 1.3.1: Copy and Paste Caption here. (Copyright; author via source)

Finally lets look at the Tools tab on the far left Blue Bar. Some of these are useful for readers and some for instructors building a text. We will concentrate here on the ones useful for readers, but first note that this clicking on OER Remixer brings you there. The Remixer tab has been moved from the horizontal bar with the signin UserID and Password. There is a direct link here to the LibreTexts Commons. Page Citations can be automatically generated and Page Attribution shows the copyright status and source of the page. Toggle AutoAttribution will show the source of individual paragraphs which is especially useful for remixes which may have material from multiple sources and Bookmark Page lets you go to this page directly once you enter the library.

We will meet the other tabs as we go through this construction manual.

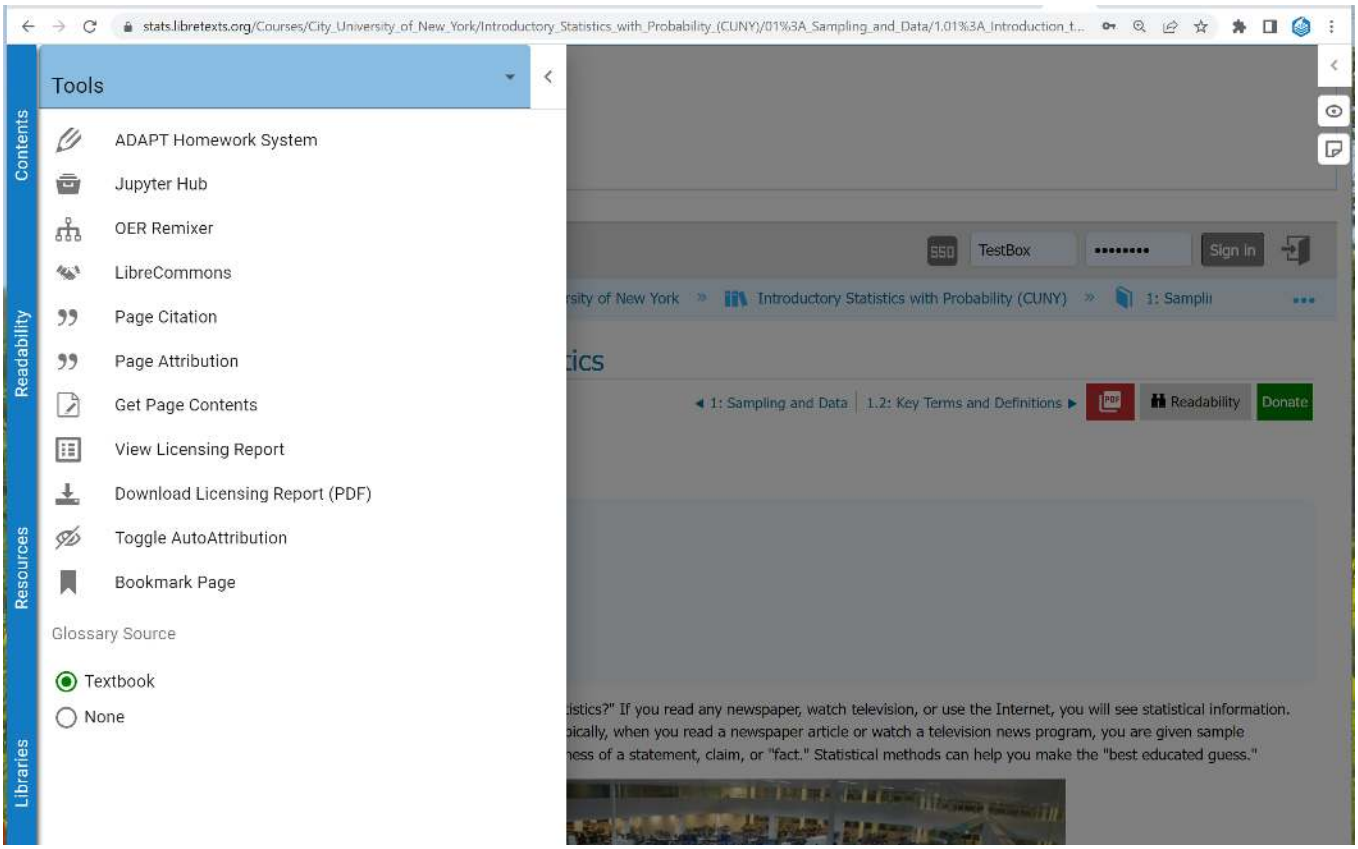


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1.4: Course Shell Checklist

This page is currently being updated

The LibreTexts project currently consists of 16 inter-operating libraries. The OER content of each library is stored within a single hierarchical tree, so that individual textbooks are part of the whole rather than independent entities. The top level of this hierarchical tree for each library consists of two primary trunks viewable on the top landing page of the respective library:



Campus Bookshelves



Bookshelves

The textbooks within the **Bookshelves** are centrally curated, as are the **Homework Exercises** and **Learning Objects**. The Course Shells area holds campus- and faculty-specific course areas. Each course shell is uniquely designed to address the needs of faculty and their students. Students and faculty can directly access their class activities here.

Terminology: Textbooks, Remixes, and Textmaps

There are specific terms that are required to be defined:

- **Textbooks** are original (all or mostly) OER texts and are identified by "Book:" in their titles. This is the traditional definition of a textbook that was constructed by one or a small team of authors with the collection of these books reflecting a traditional library or bookstore. These are stored in the Bookshelves trunk of the hierarchical tree.
- **Remixes** are texts generated (in part or completely) from existing content, often with customized content interspersed. These are usually stored in the Campus Bookshelves trunk of the hierarchical tree in areas identified by institution.
- **Textmaps** are specialized remixes that are constructed to follow the organization of existing commercial textbooks. Textmaps facilitate adoption by faculty that are switching from a commercial textbook to an OER alternative; these texts are identified by "Map:" in their titles. These are stored in the Bookshelves trunk of the hierarchical tree.

Step 1: Identify the Library

Identify the library (or libraries) in which you want to create a course shell. There are 14 independently operating libraries on the LibreTexts platform and currently each one requires independent authentication (i.e., accounts).

Step 2: Instructors Account

Anyone can view all content available on LibreTexts, you only need an account if you want to publish your own customized course. You will need an account only on the library where you want to store your text, you can reuse content across all libraries in your remix. Request an instructor's account here. To register you will have to provide an Email account and a password. We greatly prefer that those registering for an instructor's account use an institutional email (for example .edu or .org in the US). We will also ask for a URL where it is clearly shown that you are an instructor. This URL must be open for us to see the content and not require a userID/pwd. Instructor accounts are usually approved within a few days.

Step 3: Project Management and Book Creation

When you log in with your instructor's account you will have access to the Libraries and the Conductor Tool. This is described later in the manual. Using the Project Management tool you can create a Project and in one click create a rudimentary book shell which you will build out into your custom text. To complete building the structure of your book you access the Remixer from the Conductor

Step 4: Create an Empty Course

You use the Remixer to set up the structure of the book you will build. This will be described later in detail.

While the organization of a course shell can vary, they almost always have a "Text" which is typically a remix of existing material that was customized for the instructor for whom the course shell was made. Here are some examples of advanced course shells:

- https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_110A%3A_Physical_Chemistry__I/UCD_Chem_110A%3A_Physical_Chemistry_I_(Larsen)
- https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_Chem_309_-_General%2C_Organic_and_Biochemistry_(Bennett)

and a simplified course shell (consisting of only a remixed text):

- https://chem.libretexts.org/Courses/Oregon_Institute_of_Technology/OIT%3A_CHE_101_-_Introduction_to_General_Chemistry

Step 4: Create a Text

https://chem.libretexts.org/Courses/Remixer_University/Construction_Guide/6%3A_Remixing_Existing_Content

Step 5: Customize and Edit remix

Now that you have created your course shell and remix, you can customize as needed. This often requires direct editing of pages - see Construction Guide for details:

- https://chem.libretexts.org/Courses/Remixer_University/Construction_Guide/2%3A_Basic_Editing

You can make changes to your remix by simply going to the remixer again, either from the Project page (best) or from the book itself.

Step 6: Publishing

Once you are satisfied with your course shell it is ready to be moved to your Campus Hub so your students can access it. Until we get publish function implemented this will have to be done by an administrator, contact us at info@libretexts.org to publish.

Every campus can publish 5 course shells (across all libraries combined) without joining the LibreTexts Network.

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1.5: Workshop Skills Checklist

While the basic principles of editing and creating content on the LibreTexts libraries are limited, there are several skills need to master before creating and curating content. The Construction Guide and Construction Forum are great resources to consult in building these skills:

- The Construction Forum
- The Construction Guide

A recent Libretexts overview video is available too: youtu.be/sxLmeHMgvTg.

Activity 1

- When your instructor's account is activated go to the Conductor

Activity 2

- Set up a Project in the Conductor
- Build a rudimentary book shell (one click, two entries)

Activity 3

- Go to the Remixer and build a few chapters/pages in your new book
- Save the book set up in the Remixer to the Library/Workbench area and go to it

Activity 4

- Rename Page (standard is "number: Title")
- Edit page (new or blank page and edit an existing page)
- Copy/past Existing Text
- Make hyperlink
- Add Box via templates
- Add equation
- Add video
- Add table

Activity 5

- Transclude (reuse) an existing page

Activity 6 (Advance)

- Add interactive component (via transclusion)
- Add Executable code (e.g. Python, R Sagemath)

Activity 7

- Add Copyright to a page

Activity 8

- Add Authorbar to a page

Activity 9

- Watch a page (little star next to social media buttons)
- Rate a Page
- Provide Feedback

Activity 10

- Export PDF

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CHAPTER OVERVIEW

2: A Framework for Designing Online Texts

Design of an Online Textbook Replacement: a Comprehensive Guide Content, Architecture, and Pedagogy as a Framework for Design.

2.1: What is the framework for design?
2.2: Content on LibreTexts
2.3: Architecture and Pedagogy in Relation to LibreTexts
2.4: Multimedia
2.5: Scaffolding the Libretext
2.6: Bibliography

Thumbnail: www.pexels.com/photo/brown-c...ilding-154141/

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2.1: What is the framework for design?

When building a LibreTexts page, consider: **content, architecture, and pedagogy** (**CAP**) as a framework. *A framework* is a basic structure underlying a concept, system, or process. In order to maximize learning as a process, we must begin by examining the framework of learning itself -- how we assimilate new knowledge. CAP provides us a starting point to begin to think differently about *how we learn*. Are chapters the only way to learn something new? How do we think about complex ideas? Are there alternatives to traditional textbook reading and lectures? CAP provides us with helpful insights into research-based best practices to enhance student educational outcomes.

- A framework is the guiding principle behind understanding how to design or think about a teaching material.
- **Content, Architecture, and Pedagogy** (CAP) is the design framework for how to approach designing your own teaching material online.
- *Putting a PDF of a textbook online undermines all of the pedagogical advantages that the hypertext online medium has to enhance student learning.*\

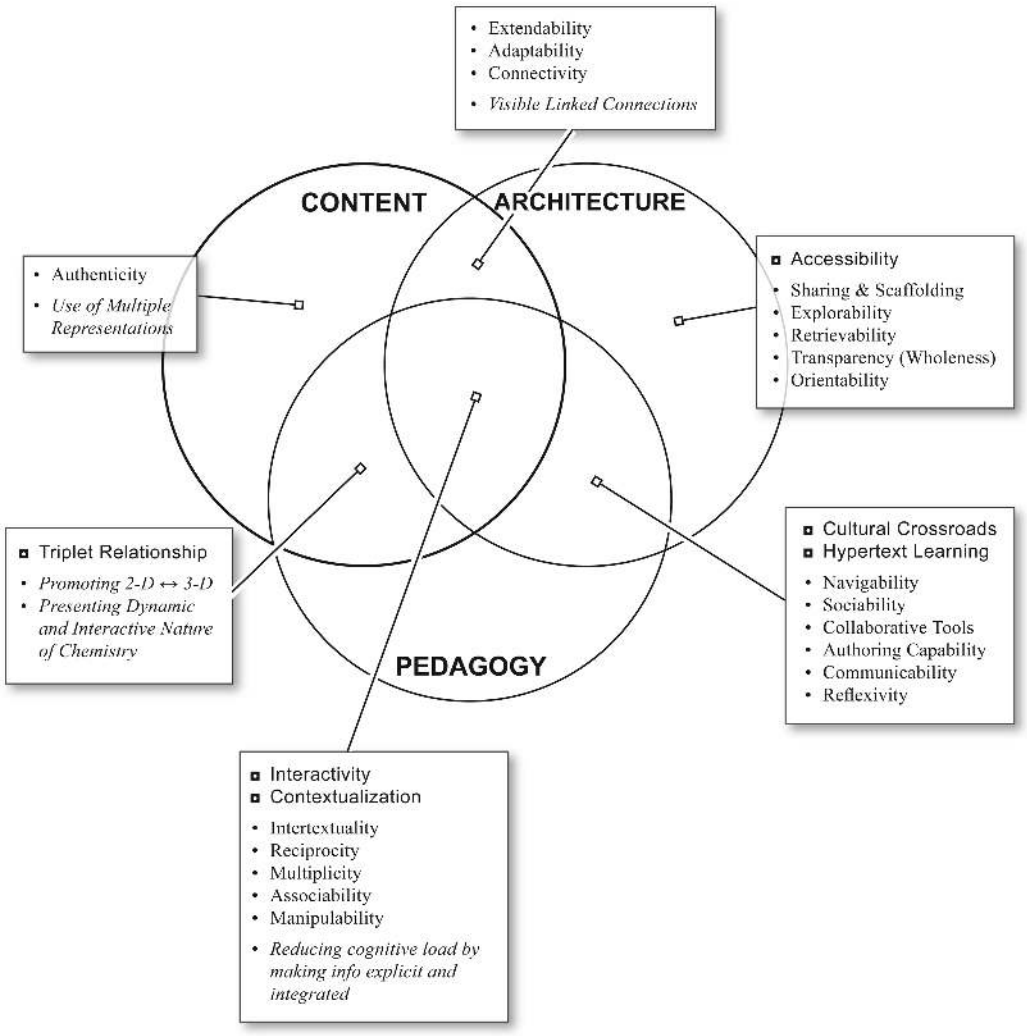


Figure 1. This diagram shows the interaction between Content, Architecture, and Pedagogy. The large square bullet points are headings from Shorb 2011.
The bullet points in *serif* font are from Yang 2001. The italicized headings are from Wu and Shah 2002.

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2.2: Content on LibreTexts

A textbook starts with some thoughts about content. What is it we want to teach? This part of CAP is obviously critical - but it is the least important to discuss in general for a few reasons:

1. Each course within each discipline is different;
2. each professor will want to cover different things in different levels of depth; and
3. it is mostly the same as what you would find in a traditional hardcopy textbook.

Notice that in Figure 1, many people have studied how to approach content within the context of Architecture and Content, but the area in the Venn diagram that is completely blank is that which is *only* Pedagogy, as that is inherently an interaction between other areas. The only thing in the Content area is whether or not the content is authentic, and whether or not multiple representations are used.

- Content in the bookshelves is largely unchanged from a hardcopy textbook, and is thus left to the author.
- **Content should never be thought of as independent from how it is taught or organized.**
- *How it is taught is the Pedagogy.*
- *How it is organized within an online textbook* is the Architecture.

The biggest thing to think about is *how* to teach this content. *How to teach* is usually the definition of pedagogy. However, here we break it into two parts: Architecture and Pedagogy. Architecture is the static structure of the course materials: where are things found, how are they linked, what is the organization in general. Pedagogy, here, is how you expect people to interact with your content and what approaches, models, samples, and images within your content will be included.

Questions to Ask Yourself

- What are your learning objectives for the course?
- How many are you teaching in a given lecture? In a given exam period?
- What conceptual links between material are important for your students to understand?
- What depth does a concept need to be covered?
- How are you going to assess your content?
- How many sample problems should be included?

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2.3: Architecture and Pedagogy in Relation to LibreTexts

- Individual pages should have a layout that contributes to effective learning.
- The units, weeks, or days can have their own effective architecture.
- The course as a whole can have its own architecture to lower cognitive load.

When building a LibreTexts course, the layout and design will influence learners and their ability to retain new information. This is both due to how content is laid out within a given page, but also in how to organize the pages into a full set of learning materials. Because online platforms provide the user with greater customization capabilities, we are able to implement psychologically sound architecture principles and pedagogical foundations. These principles include the implementation of multimedia, scaffolding complexes, and hypertext extensions.

Questions to Ask Yourself

- How many learning objectives will be on a single web page?
- If things are connected, should they be covered at the same time? On multiple pages? Hyperlinked in some way?
- How integrated do you want your syllabus to be? Do you use an online course manager? Do you want that to be your syllabus?
- Where will your homework be accessed? Do you need graded and ungraded homework?
- How integrated into the real world (even online materials: journal articles or news sites) do you want your course to be? How is that integrated?
- Does a single concept have multiple approaches or perspectives? How independent are they? Should they be linked or integrated?
- Is the navigation of your syllabus and course intuitive? Does it help reinforce concepts or connections?
- How important are multiple representations? 2D to 3D? Various models for representing similar materials? Real-world images vs. cartoons vs. models?
- When will being able to interact with data/plots/models be beneficial? When may it be distracting?
- How do you organize a *page* of information?
- **Are you including something because it *can* be included or because it *helps learning?***

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2.4: Multimedia

This section details how to approach the use of Multimedia within a page, as well as how to approach organizing your course through the use of scaffolding and hypertext.

- Adding images to text is beneficial for learning.
- Multimedia must be complementary, not redundant.
- Think beyond the textbook as far as potential material that could be linked

Wu and Shah's 5 design principles to guide development

- Provide multiple representations and descriptions
- Making referential connections visible
- Presenting the connection between text and model
- Promoting the transformation between levels of representation (2D to 3D, primary to secondary, or various scales)
- Reducing cognitive load by making information explicit and integrating info for students

When using multimedia, consider the following research-based recommendations (Michas & Berry, 2000):

Adding pictures to text is more beneficial with captions and labels

The benefits of adding pictures to text are well known throughout education literature including the work of Michas and Berry (2000) and Paivio's (1969) dual coding theory. The dual coding theory hypothesizes that the formation of mental images aides in learning. For example, words gained deeper meaning when connected with pictures/models, therefore aiding in students' retention and memory. That is to say, we learn information most effectively when we pair images with words.

Connection tables are not necessarily unique

We could draw up other tables of atoms and bonds that represent this compound as well: for example, *SCT II* and *SCT III*. This is an important point: **connection tables are not necessarily unique**. Different tables can represent the same chemical structure. (Of course, there are many situations in which it is useful to have a unique connection table for each chemical structure. There are algorithms for selecting such preferred or "canonical" connection tables.)

SCT I

Atom table

Atom #	Atom type
1	C
2	C
3	C
4	O

Bond table

Atom 1	Atom 2	Bond order
1	2	1
2	3	1
2	4	1

SCT II

Atom table

Atom #	Atom type
1	O
2	C
3	C
4	C

Bond table

Atom 1	Atom 2	Bond order
1	3	1
2	3	1
3	4	1

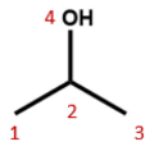
SCT III

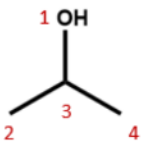
Atom table

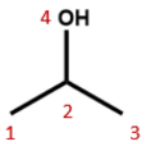
Atom #	Atom type
1	C
2	C
3	C
4	O

Bond table

Atom 1	Atom 2	Bond order
2	3	1
1	2	1
4	2	1







Demonstration videos are more effective than pictures in explaining procedures

Although videos are more effective in showing how to perform a task, still images are more effective when students are asked to recall step-by-step procedural information on a test.[2]

Multimedia must be complementary, not redundant

In order for multimedia to be effective, both forms of media must compliment the other. In doing this, the two forms of media create a flow through the material that stimulates multiple directions of learning. However, be **cautious of repetition in the material**, as repetition can confuse the learner.

Students who self-reflect at the end of learning material retain more information

In a study conducted by Chi et al. (1994), researchers found that learners who self-explained what they were learning retained the information better than learners who only read material. In other words, student learning outcomes are improved when students are forced to describe, in their own words, what they have learned in the covered material. Asking students to do this at the end of a lecture or at the end of a chapter may help in retention.

Questions to Ask Yourself

- What assumptions are you making about the understandability of an image or model?
- What level of guidance does your media require?
- Does this require text and also narration? One or the other? Highlights?
- What is understandable without this image?
- What implications for accessibility are required to be considered for these images?

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2.5: Scaffolding the Libretext

- The primary mechanisms of scaffolding include structuring the learning task and problematizing the work.
- Hypertexts, like the LibreTexts, provide non-linearity and interactivity.
- How students use online materials is inherently different than a book read cover-to-cover; hypertext can provide the context that a narrative could provide.

Scaffolding complexes provide a beneficial structure that aids in the learner's ability to learn new information, as well as accomplish more difficult tasks by giving directionality to learning.

As you implement new scaffolding techniques inside LibreTexts, here are some things you may want to consider:

1. Scaffolding should problematize work. Problematization is the process in which the student is challenged to recall material, either through quizzes, tests, worksheets, etc. In the short term, this is more difficult for the student. However, in the long term, student learning outcomes are improved. *The trick is to find a balance, where the student is challenged in their work, but not over-challenged to the point where they are unmotivated, frustrated, and unproductive.*
2. Effective scaffolding should structure tasks logically. The structure of a task should be compatible with lesson plans and assignments, such that the progression of material *makes sense*. This will help learners maintain direction as they are working their way through new material. In LibreTexts, this can be done through the use of hypertext, as well as guided lesson plans.
3. Hypertext extensions are also incredibly beneficial in the learning process (Hui, 2018). Hypertext enables users to navigate quickly between different pages, as well as access specific information that may be beneficial in the learning of specific material.

An example of scaffolding

Take some aluminum foil. Cut it in half. Now there are two smaller pieces of aluminum foil. Cut one of the pieces in half again. Cut one of those smaller pieces in half again. Continue cutting, making smaller and smaller pieces of aluminum foil. It should be obvious that the pieces are still aluminum foil; they are just becoming smaller and smaller. But how far can this exercise be taken, at least in theory? Can one continue cutting the aluminum foil into halves forever, making smaller and smaller pieces? Or is there some limit, some absolute smallest piece of aluminum foil? Thought experiments like this—and the conclusions based on them—were debated as far back as the fifth century BC.

John Dalton (1766-1844) is the scientist credited for proposing the atomic theory. The theory explains several concepts that are relevant in the observable world: the composition of a pure gold necklace, what makes the pure gold necklace different than a pure silver necklace, and what occurs when pure gold is mixed with pure copper. This article explains the theories that Dalton used as a basis for his theory:

1. Law of Conservation of Mass
2. Law of Definite Proportions
3. Law of Multiple Proportions

Law 1: The Conservation of Mass

"Nothing comes from nothing" is an important idea in ancient Greek philosophy that argues that what exists **now** has always **existed**, since no new matter can come into existence where there was none before. Antoine Lavoisier (1743-1794) restated this principle for chemistry with the law of conservation of mass, which "means that the atoms of an object cannot be created or destroyed, but can be moved around and be changed into different particles." This law says that when a chemical reaction rearranges atoms into a new product, the mass of the reactants (chemicals before the chemical reaction) is the same as the mass of the products (the new chemicals made). More simply, whatever you do, you will still have the same amount of stuff (however, certain nuclear reactions like fusion and fission can convert a small part of the mass into energy.

The law of conservation of mass states that the total mass present before a chemical reaction is the same as the total mass present after the chemical reaction; in other words, **mass is conserved**. The law of conservation of mass was formulated by Lavoisier as a result of his combustion experiment, in which he observed that the mass of his original substance—a glass vessel, tin, and air—was equal to the mass of the produced substance—the glass vessel, "tin calx", and the remaining air.

An example of scaffolding

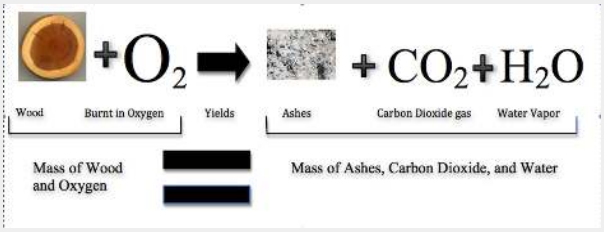


Figure 2.1.1: Image of the wood courtesy of Ehamberg and Stannered on Wikimedia Commons, available under Creative Commons Attribution 2.5 Generic license. Image of ashes courtesy of Walter Siegmund. Image as a whole constructed by Jessica Thornton (UCD).

4. *Create an **agenda page** to organize complex material*. Dr. Zsofia Vörös et al. (2011) found that it is important to provide high-level content organizers that help guide the learner through the various hypertexts. This takes shape in the form of the agenda page, pictured below. This supplements the scaffolding, as it helps guide the learner through the material in an effective manner.

Agenda for a class

Agenda for today's class (80 minutes)

1. (20 minutes) Review Pre-class assignment
2. (30 minutes) Matrix Representation of Vector Spaces
3. (30 minutes) Practice Example

Agenda for a course

Lecture 1: Administrative Matters and Experimental Design

Welcome to Bis2A SS2!

Read up on the characteristics of the three kingdoms of life: Archaea, Bacteria and Eukaryotes.

Have your sketch book/note paper ready today. We will be drawing and sharing pictures!

Learning Goals:

- A.1 Be able to describe (or at least look up) the structure and administrative details for this course from the syllabus.
- A.2 Be able to use the syllabus, Canvas, LibreText and Nota Bene as tools to gather information necessary to address questions you have been asked in class.
- A.3 Define and correctly use vocabulary terms used in the pre-lecture study guide, in assigned readings, and in lecture.
- A.4 Create a hypothesis or prediction based on given experimental data.
- A.5 Design an experiment with proper controls based on background material provided.
- A.6 Use the principles of the "design challenge" to dissect a complex problems into small manageable questions that can be addressed.
- A.7 Create a conceptual drawing of a cell that reflects your current mental model for how several requirements for life are manifest.
- A.8 Interpret information presented to you in graph form.

Readings

- Welcome to BIS2A
- The Scientific Method
- Problem Solving
- The Design Challenge#

Lecture 2: Organelles, Characteristics of Atoms and Functional Groups

Chemistry review starts today! You will be expected to know Ionic, Covalent and Hydrogen bonding. Please check out all the learning goals associated with bonds and functional groups after lecture today. This is not a chemistry class but you would be

surprised how much chemistry is in biology.

Cellular Infastructure LG:

- 3.1 Identify and illustrate the components of subcellular infrastructure that are important for distinguishing prokaryotic and eukaryotic cells and different types of eukaryotic cells.
- 3.2 Describe the functional roles of the cell membrane, the nucleus, the mitochondrion, the endoplasmic reticulum, the Golgi apparatus, the peroxisome, the lysosome, the vacuole, and the chloroplast and the interrelationships between them.

Biological Chemistry LG

- 1.1 Explain the nature of the different types of molecular bonds associated in biomolecules.
- 1.6 Explain how water is used for condensation and hydrolytic reactions.
- 1.8 Be able to use chemical principles to make predictions/hypothesis about familiar or unfamiliar functional groups.
- 1.24 Define electronegativity and explain how this concept is used to predict bonding patterns and how two atoms interact.

Readings

- Bacterial and Archaeal Diversity*
- Eukaryotic Cell: Structure and Function*
- Electronegativity
- Bond Types—Ionic and Covalent
- Hydrogen Bonds
- Functional Groups

and so on. . .

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CHAPTER OVERVIEW

3: Basic Editing

The LibreTexts libraries are powered by the Mindtouch system. An exhaustive set of references for the tools on this powerful system can be found online at https://success.mindtouch.com/Author/Editor. The pages below summarize a subset of these tools that are useful in day-to-day use of the LibreTexts project.

An Instructor's account allows editing capability on essentially all pages in the library

- The wiki infrastructure of the LibreTexts makes it difficult to break anything. So feel free to experiment, play around, and test things out.
- All edits are saved as revisions. You can always revert to any older revision via the “Revision history” button under “Options”
- All edits get sent to the LibreTexts development team for eventual review (not approval).
- You can sign up with your personal account to “Watch” page(s) if any edits occur (using the little star next to forward/back right below the page title).

3.1: Successfully Logging In
3.2: Editing a Page
3.3: Adding Images and Figures and Video
3.4: Adding Videos (YouTube)
3.5: Adding Tables
3.6: Hyperlinking
3.7: Adding Predefined Template Code (e.g., Boxes)
3.8: Accessibility Checking
3.9: Selecting Copyright for Page (Meta-Tags)
3.10: Adding Authorbars (Meta-Tags)
3.11: Page Titles
3.12: Adding Summary
3.13: Watching, Rating, and Providing Feedback for a Page
3.14: Image Resources

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3.1: Successfully Logging In

Before editing a page, you must first log in to the LibreTexts with an account that has editing capabilities. If you do not have an account register at https://register.libretexts.org for an Instructor's account. Please remember to specify ONE library to use as your home library (content you create can be moved to other libraries) and provide a URL that shows your name as an instructor/teacher/faculty member. Once provided, sign in to a library by entering your credentials into the toolbar below the list of libraries. If you have forgotten your password, hover your cursor over the "door" symbol next to the sign in button and select to have a reset password link sent to you.



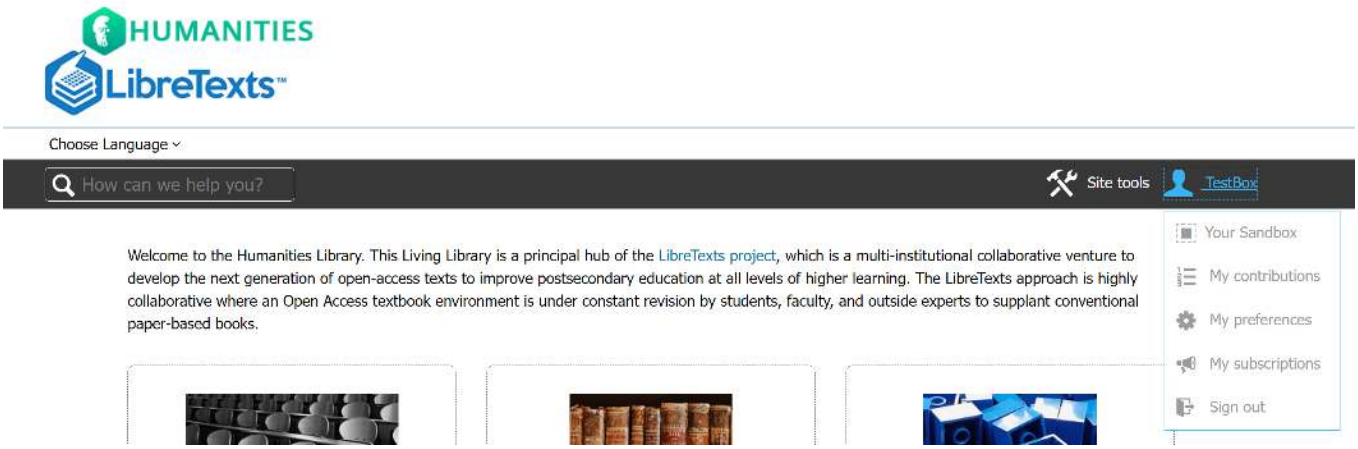
Figure 3.1.1: Gray Toolbar when not logged in.

If the bar is grey after you sign in (like above), you **do not** have editing capabilities; in that case, you can write info@libretexts.org to request your permissions to be updated. After you log in you should see a black bar



Figure 3.1.2: Black Toolbar when successfully logged in with an instructors account.

Now you can navigate to your sandbox by pulling down the menu under your userID (TestBox in this case)

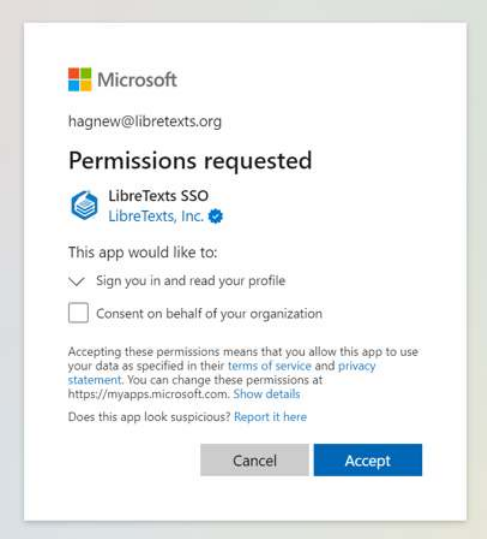


My preferences lets you change your password.

Caution

The SSO system is coupled to accept both google and microsoft authenticated networks so that if your campus is part of either, you can use your campus account to sign in. However, Microsoft provide additional freedoms to campuses to verify vendors (like LibreTexts) to access campus authentication.

Below is what it looks like for an admin to “Consent on behalf of your organization”.



Even though LibreTexts, Inc. is already verified with Microsoft, in this case it also has to verify with the local IT department of the campus. That can be a fast or slow process. If instant access is needed (and Google isn't an option), we can provide local authentication. Contact support@libretexts.org for help.

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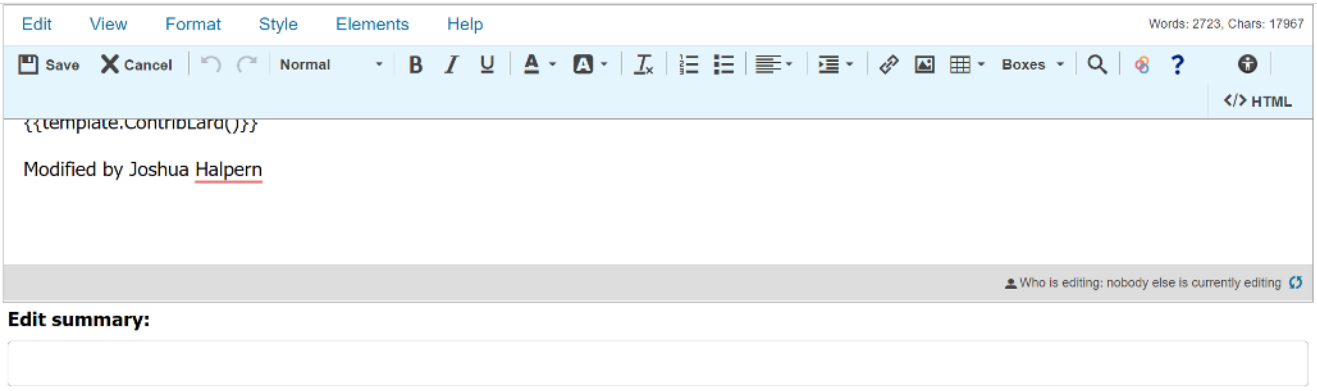
3.2: Editing a Page

If you are new to LibreTexts and need to start on your text, the best thing is to use the Remixer to start. Go to Chapter 7 to learn how to set up your book.

The Mindtouch platform we are using for the LibreTexts uses a modified CKE editor that allows for module construction without having to build/edit the raw source (HTML) code directly. The LibreTexts editor is a WYSIWYG editor that automatically creates HTML from visual authoring. The editor displays when you create a new page or edit a page. We strongly recommend that you use the Remixer to create new pages as it will automatically renumber chapters and pages as needed after you add the page. The CKEditor is a ready-for-use open source WYSIWYG text editor from CKSource designed to bring common word processor features directly to web pages, simplifying their content creation.

You can only edit pages for which you have editing permission, generally speaking pages in your sandbox, your team's sandbox if you are a team member, and pages in books that you have created, either de novo or by remixing.

1. Navigate to the page you want to edit.
2. On the MindTouch toolbar, select **Edit**.
3. Edit the content as necessary. See a complete list of editor tools.
4. In the **Edit summary** field at the bottom of the page, leave change notes for other editors or yourself (optional). Edit summaries can be viewed in the page revision history.
5. Click **Save** to save the changes you made.



Automatic saving & Word Counts

- **Automatic saving** - By default, the LibreTexts libraries autosaves pages every **25** seconds in case your browser crashes or computer restarts so that you can return to the page and pick up where you left off.
- **Word count** - A word and character count is displayed in the upper right corner of the editor UI.

The Editor

The Editor has been configured for most of the needs contributors require. The layout is below; please refrain from using the advanced features in red until you are familiar with the Mindtouch structure. The Toolbar is the section located at the top of the editor window. It contains menu buttons that give you access to various functions of CKEditor. All buttons are grouped according to their function and include both simple operations (like basic text styling or formatting) and more advanced features (like inserting media or forms via a dialog window).

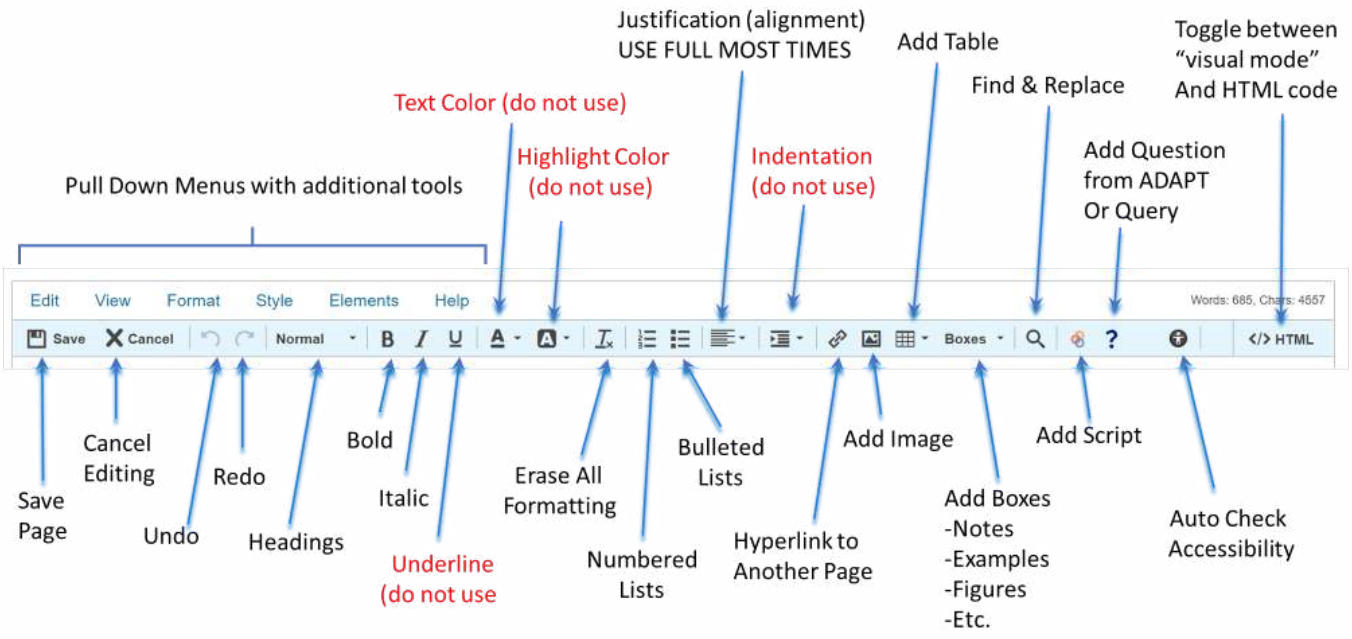


Figure 3.2.1: A simple layout of the Mindtouch editor. Tools in red are rarely used in the LibreTexts typesetting standard.

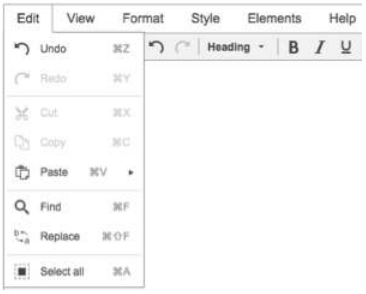
Do no harm (or illegal activities)

You are responsible for the content that you provide, including but not limited to photos, profiles information, messages, search results edits, and other content that you upload, publish or display on or through LibreTexts, or transmit to or share with other users. You may not submit content to LibreTexts that you did not create or that you do not have permission to submit. You understand and agree that others may, but are not obligated to, edit, delete or remove (without notice) any content from LibreTexts, for any reason or no reason.

Drop-down Menus

Drop-down menus within the Editor Toolbar contain tools organized by Edit, View, Format, Style, Elements, and Help.

Edit Menu



The **Edit** menu contains the basic actions your authors can use within the editor.

- **Undo**
- **Paste:** Paste cut or copied content from your operating system clipboard.
  - Modern browsers to not allow **Paste as Plain Text** or **Paste from Word** options.
- **Find**
- **Replace**
- **Select all**

View Menu



The **View** menu allows authors different ways to see the content they'll be editing.

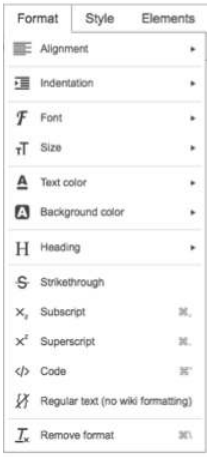
- **Source** - View and edit the HTML source for the page
- **Show blocks** - See the content blocks in WYSIWYG mode in order to better identify the HTML structure and format of your content

Format Menu

The **Format** menu contains tools that allow authors to change the look of selected text.

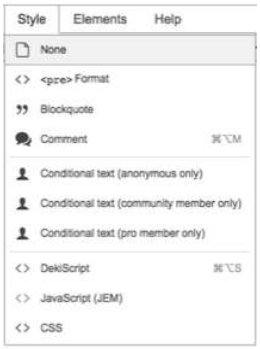
- **Alignment**
- **Indentation**

- **Font** - Change the font for selected text. (DO NOT USE)
- **Size**
- **Text color**
- **Background color**
- **Heading** - In the pages, the headings start with H2, H1 is reserved for the title of the page
- **Strikethrough:** Strikes a line through selected text. For example: ~~these words~~.
- **Subscript:** Add a small letter or symbol below a line. E.g. writing the chemical compound N_2
- **Superscript:** Add a small letter or symbol above a line of text. E.g. writing equations $2^3 = 8$
- **Code:** Insert a code block or apply a code block to selected text.
- **Regular text:** Exclude selected text from being parsed by the editor.
- **Remove format:** Remove all formatting from the selected content.



Style Menu

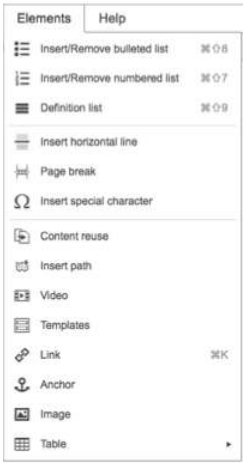
The **Style** menu contains options for changing content behavior or appearance.



- **None**
- **<pre> Format** (DO NOT USE)
- **Blockquote**
- **Comment**
  - Only appears when the page is being edited.
  - Great for showing a replaced image when one is updated or corrected.
- **Conditional Text** (ADVANCED USE ONLY)
  - Anonymous only
  - Community member only
  - Pro Member only
- **DekiScript**
- **JavaScript (JEM)**
- **CSS**

Elements Menu

The **Elements** menu contains options to insert media or alter HTML elements.



- **Insert/Remove bulleted list**
- **Insert/Remove numbered list**
- **Definition list**
- **Insert horizontal line**
- **Page break**
- **Insert special character**
- **Content reuse**
- **Insert Path (DO NOT USE)**
- **Video**
- **Templates**
- **Link**
- **Anchor**
- **Image**
- **Table**

Help Menu

The **Help** menu links to references about the MindTouch Editor.



- **Help**
- **Keyboard shortcuts**

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3.3: Adding Images and Figures and Video

Images can be added to LibreTexts via two primary mechanisms:

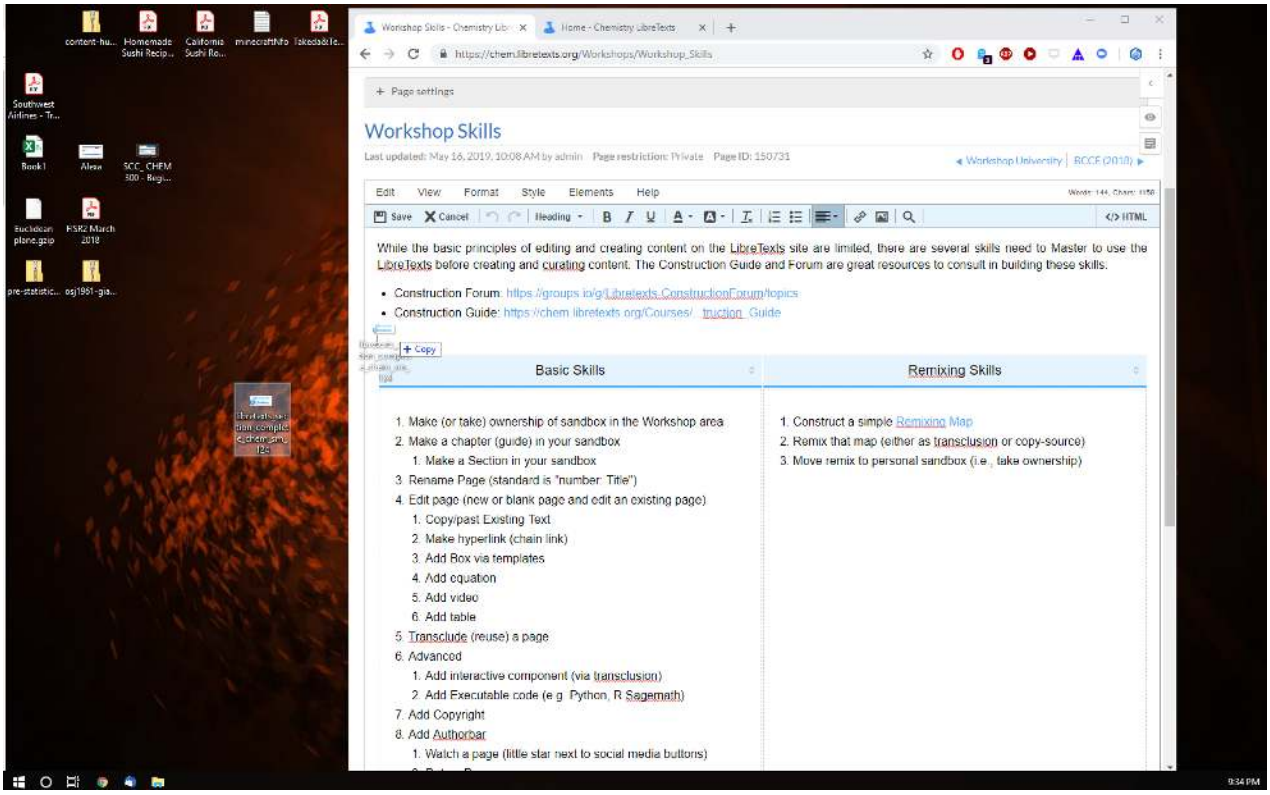
Adding Figures the Hard Way - Manual Upload

Three steps to add non-copyrighted (e.g. public domain, Creative Commons, original photos or figures) images or pictures:

- "Save" the figures into jpg, png, gif or some other graphics file depending on the program you are using to make the image.
- Then "attach" the file using the lower right hand button on the page or under the "more" button.
- Then "edit" the page with the edit button and "link" the file to your page with "insert/edit image" button.

Adding Figures the Easy Way - Drag and Drop

- "Save" or "export" the figures into jpg, png, gif or some other graphics file depending on the program you are using to make the image (JPG and PNG are preferred).
- Drag and drop the image from your desktop to your page (while editing).



Additional factors to pay attention to regarding figures

- **NO BMP** figures are allowed to be imported. Avoid TIFF. Use PNG, JPG, GIF figures instead.
- Please CROP your figures to remove superfluous white space that makes reading your module awkward. The Microsoft Office Picture Editor or Paint will crop images and is free on MS operating systems.
- All figures constructed for this project must have the original image files used uploaded to the LibreTexts, preferable in the module itself. DO NOT HOTLINK images. Hotlinks in general are prone to vaporization.

The Medium Way - Copy and Paste Screenshots

Often when integrating content from dead libraries like PDF or scanned images, the Print Screen option can be used. On PC, there is a "Print Screen" button on the upper right corner of the keyboard that will take a screen shot of the screen and store it in the computer clipboard. This can then be "pasted" directly via the control-v combination directly into the LibreTexts Editor. The

problem with this is that the image that is being copied and pasted via this mechanism will typically have superfluous content around it and will need to be cropped before editing. There are two ways to address this:

- Paste the screen shot into a image editor (e.g., Paint in Windows or Powerpoint) and then crop it in that respective software, save into a file and drag-and-drop into the page as discussed above.
- Alternatively, a screen shot **snipping tool** can be used to selectively copy the image on the page from the rest of the screen (sort of like pre-cropping) and then you can paste directly into the editor (https://support.microsoft.com/en-us/help/13776/windows-use-snipping-tool-to-capture-screenshots).



There are other snipping tools available via a simple Internet Search. Apple computers have a similar snipping tool. You can use Shift-Cmd-4 to save a screen snip of an image on the screen. This image file can then be edited as needed and then imported into a LibreTexts page, following the protocol described above.

Formatting Figures

Double-click on an image (in edit mode) to open its settings and make sure these settings are set correctly:

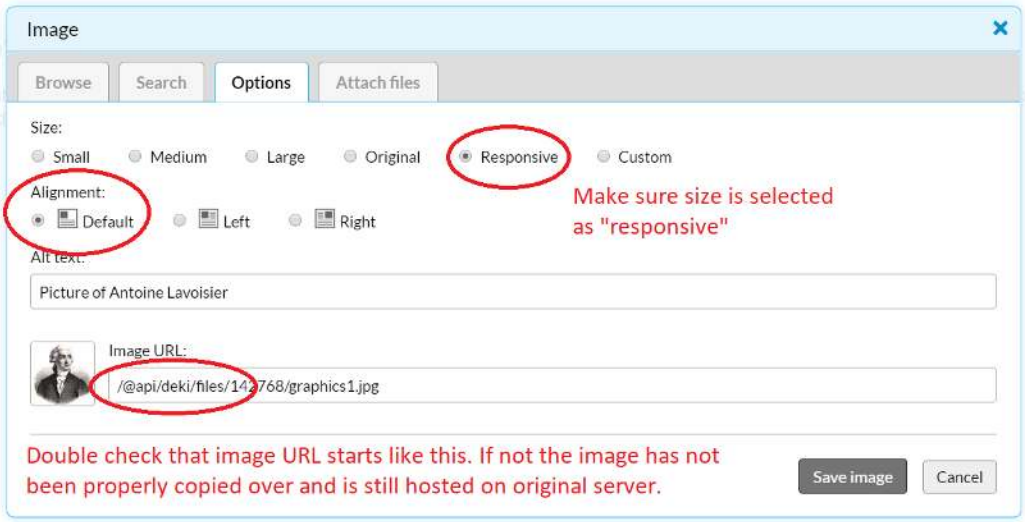


Figure 3.3.1: Image settings

To center justify figure, click on the right side of the image (not the figure) and you can use the center justification for text off the normal editing toolbar.



Figure 3.3.2: How to center justify figures

Adding Captions

To add a caption add a line under the figure formatted as

```
Figure \(\PageIndex{i}\): Copy and Paste Caption here. (Copyright; author via source
```

where i is the number of the figure on the page. This automatically formats the caption into the caption style you see on the figures on this page. Unfortunately, if you add another figure that requires renumbering the figures after it this still has to be done manually. You can use (\PageIndex{n}\) to sequentially number tables, videos, examples, etc. All figures should be open source, if possible provide a link to the original source.

Figure captions Format

The figure label should be formatted as shown for the figure above:

- Center justified
- "Figure" in bold followed by numbering with a page index command and a colon like this: Figure `\(\PageIndex{1}\):`
- Manually enter the figure number in the \PageIndex command, "1" for the first figure of the page, "2" for the second, etc.

Advanced (alt-texts)

Each Figure and Table has a simple option to add alt-texts. Just double click on the image to get the figure setting (Figure 1.3.1) and you can add alt-test into the entry. See section on Alt-texts for more details.

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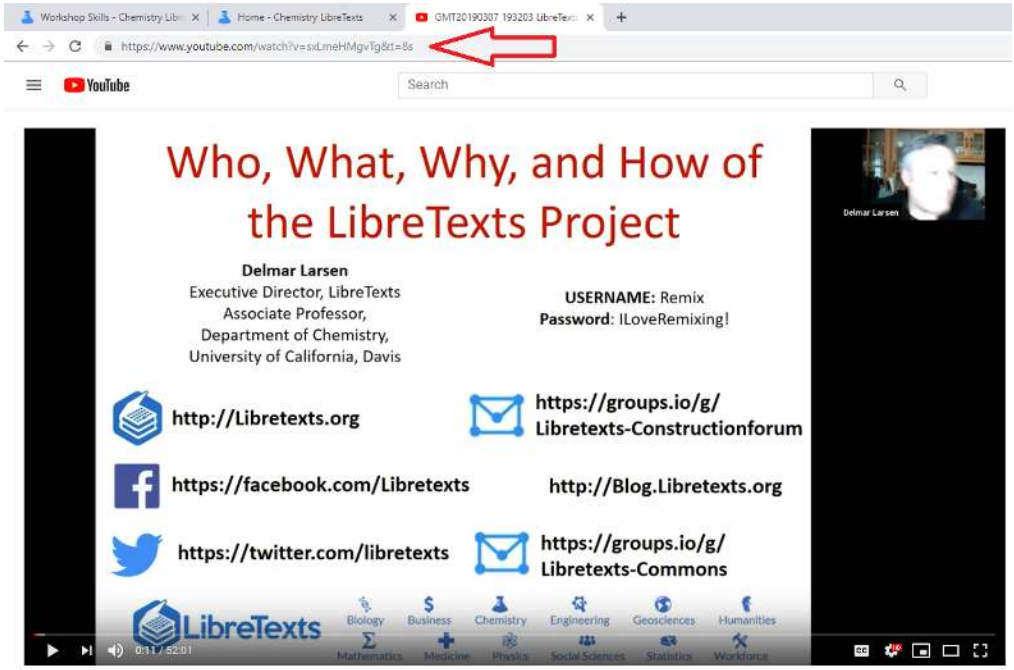
3.4: Adding Videos (YouTube)

Our tutorial for adding videos is on YouTube: youtu.be/zuzkGdWawy0

Currently the best way to add videos is to link to YouTube videos, although other streaming platforms will work. The following steps can be use to embed YouTube videos.

Step 1

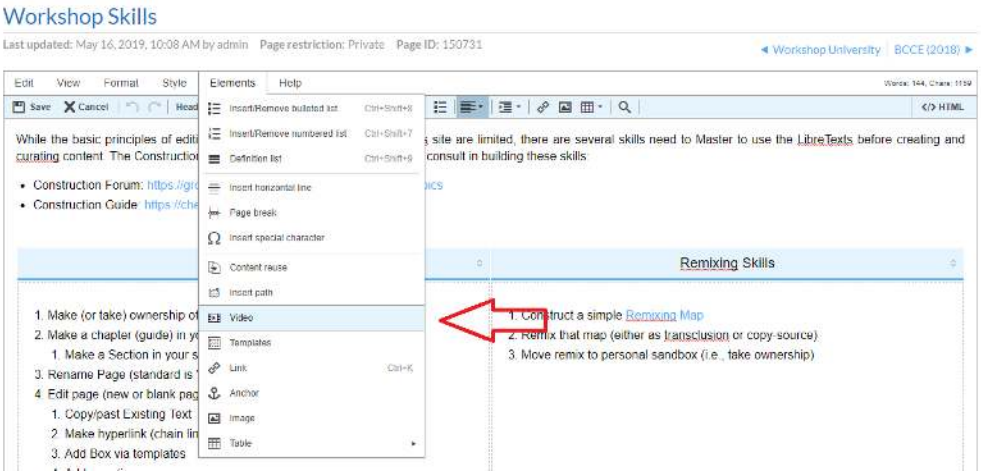
Identify the URL of the video you want. This is typically done by finding the video and copying the URL from the web browser URL line. For the video below, the URL is "www.youtube.com/watch?v=sxLmeHMgvTg&t=8s"



GMT20190307 193203 LibreTexts 1920x1050

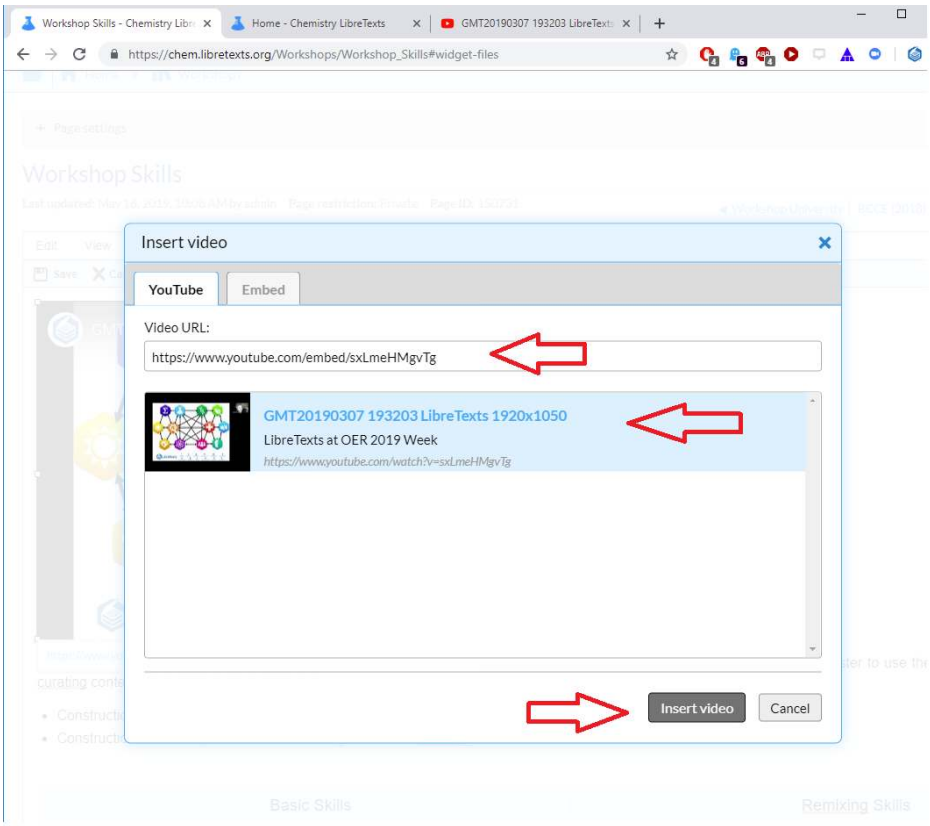
Step 2

Select "Elements" in the toolbar and select "video".



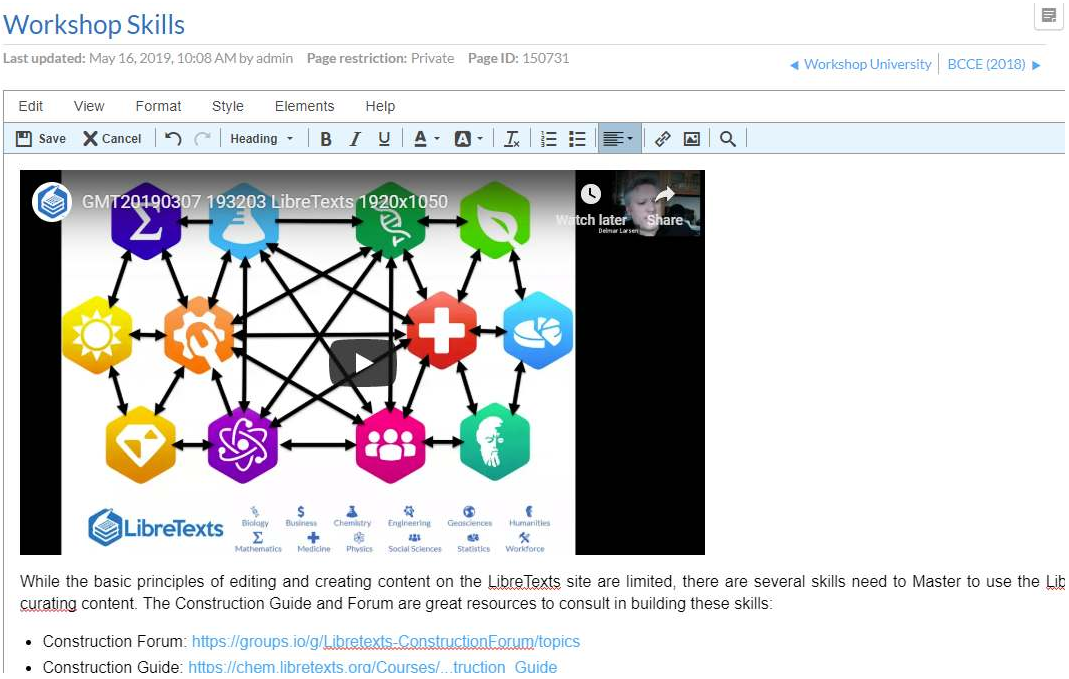
Step 3

Paste the URL into the "Video URL" line and select the video on panel below. You can use this as a search through YouTube for different videos (however most people just use Google search directly outside of the LibreTexts platform). Press "Insert Video".



Step 4

The video will appear as an integrated part of the page but will be streaming from YouTube. You can scale the video down (recommended), if too large.



Step 5

Add a caption to the video just like with figures. It is recommended that the URL of the video be added to the caption

This is the video embedded into this page after following the above steps:



If you are adding video from another source, select embedded and past the <iframe></iframe> code that you get from that source.

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3.5: Adding Tables

Tables are adding by via the menu "Elements" in toolbar and selecting Table of directly via the editor toolbar (see below).

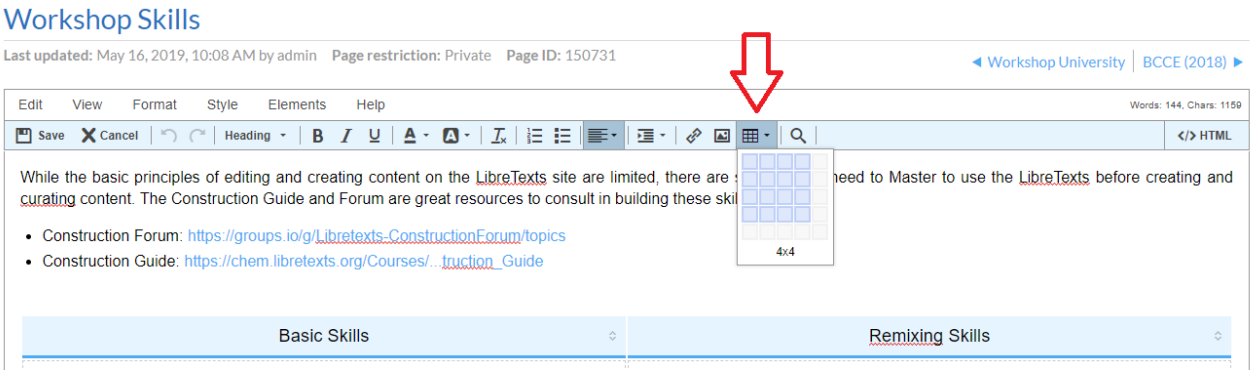


Figure 3.5.1: How to add a table from the editing tool bar.

You can choose the number of rows and columns you need (can be changed later). This gives you an empty table structure that you can start to fill out. If you want to delete a row, select an entry in the row you want to delete and click on the x that appears to the left. If you want to add a row above or below, you can do that by clicking the > that appears above or below the x respectively.

> *If you are copying a table from a website you will likely be able to copy its structure via a simple copy-paste.*

Right click on the table and select table properties. Here you can choose whether the first row and/or column is headings and add a caption to the table. Making the first row/column headings is useful for screen readers and strongly recommended if possible. Allow table to be responsive, this ensures proper viewing on all types of viewing devices.

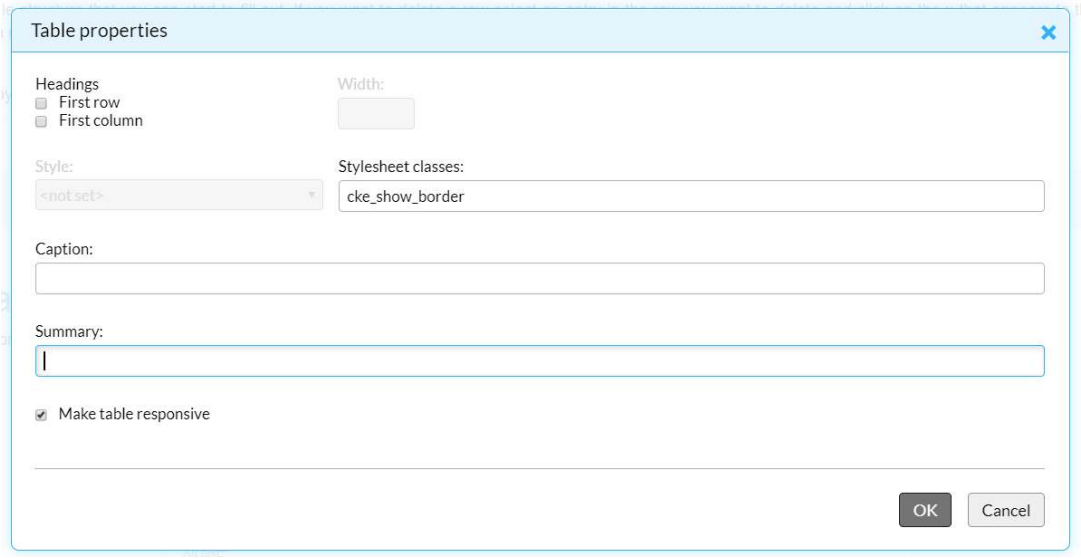


Figure 3.5.2: Table properties for Libretexts tables.

Always be Responsive

It is a good idea to select the "make table responsive" section (see Figure 3.5.2) of any new table so that it will be easily viewable on mobile devices and computers.

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3.6: Hyperlinking

Our hyperlink video tutorial on Youtube: youtu.be/gUId6IMltp8

To ensure effective coupling of pages within the LibreTexts, content on pages can be "hyperlinked" to other pages. This is a simple process:

- Mark the word you want to be the hyperlink, then click the hyperlink button with the "chain link" icon.
- If you want to link to an outside page, place the address in the “link to” box and click “update link”.
- If you want to link to an internal LibreTexts module, you can use the “browse” option to find the page. You can also use the search function to look for key words (make sure you check that the page is a relevant link though).

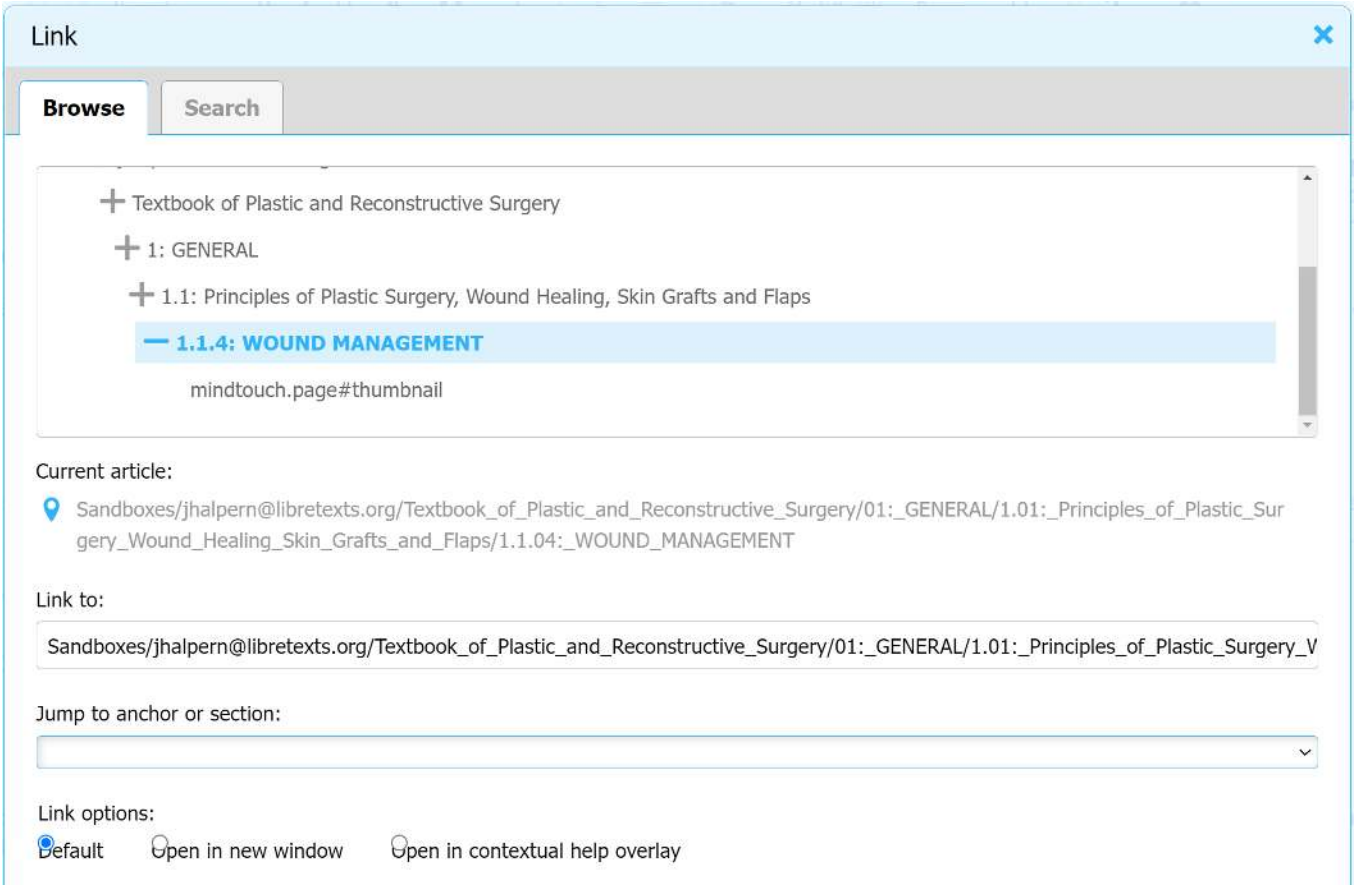


Figure 3.6.1: How to add a hyperlink

Link Farming

DO NOT HYPERLINK OUTSIDE OF THE LIBRARY UNLESS NECESSARY. WHILE CURATING IS KEY TO THE LIBRETEXTS PLATFORM, LINK FARMING (CURATING DEAD LINKS) IS TO BE AVOIDED.

If you select a section of the text you can insert a link in the Link to: box which appears in the dialog shown below. You can use the browse box to find any section of any text in the library you are working in. If you are linking to another library you will have to find the URL by exploring that library in another browser window.



Anchors

Links to other pages in LibreTexts will take you to the top of the page. You can set anchors which, together with the page URL will take you to any location on the page. Headings are automatically set as Sections which are a special class of anchors, but you may want to set an anchor next to an equation or an image, a table, or a special part of the text.

To do so place the cursor where you want to set the anchor, select Anchor from the Elements dropdown at the top of the Editor and fill in a name for the anchor.

After an anchor has been set, when you are building a link to it you can select the Anchor from the list at the bottom of the Link page where is says **Jump to anchor or section**:

You can, for example, set anchors next to each reference in a list, and then set a link in the text to that anchor where the reference is invoked

---

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3.7: Adding Predefined Template Code (e.g., Boxes)

Under Elements of the editing toolbar, there is an option for "Templates". These are specialized code snippets that are designed for adding standard code to your page. Some of these are available using the Boxes pull down at the right side of the editing bar.

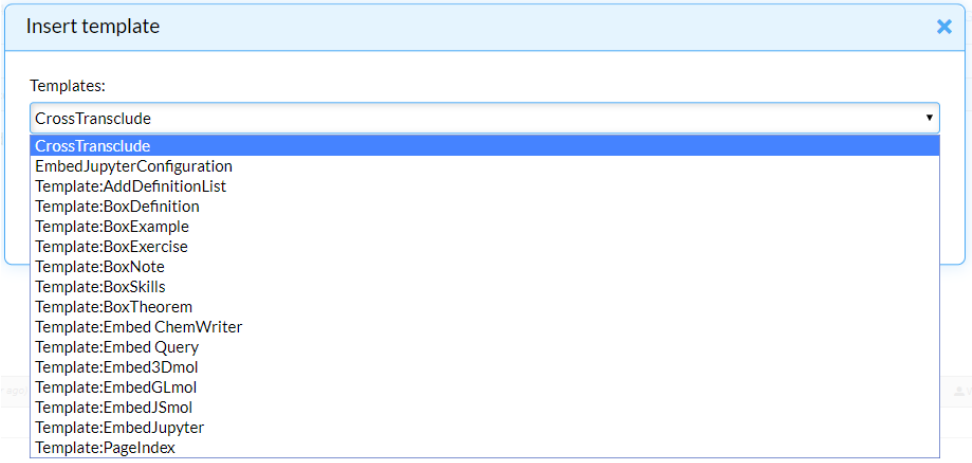


Figure 3.7.1:

Some of these templates are for general use and other are more specific. The six BOX templates add the text for a container around special text (see below). The Embed templates are for special HTML5 interactive code like Jupyer executable code or interactive molecules. The other templates will be discussed in a different section. Feel free to add any of them to a test page to see what it does.

Definition BOX

The ideal gas law is easy to remember and apply in solving problems, as long as you get the **proper values a**

Example BOX: 3.7.1

Add text here.

Solution

Add text here.

Exercise BOX: 3.7.1

Add exercises text here.

Answer

Add texts here. Do not delete this text first.

Note BOX

The ideal gas law is easy to remember and apply in solving problems, as long as you get the **proper values a**

Skills Box

- Explain the following laws within the Ideal Gas Law

Theorem BOX: 3.7.1

The probabilities assigned to events by a distribution function on a sample space are given by.

Proof

Add proof here and it will automatically be hidden

Caution BOX

The ideal gas law is easy to remember and apply in solving problems, as long as you get the **proper values a**

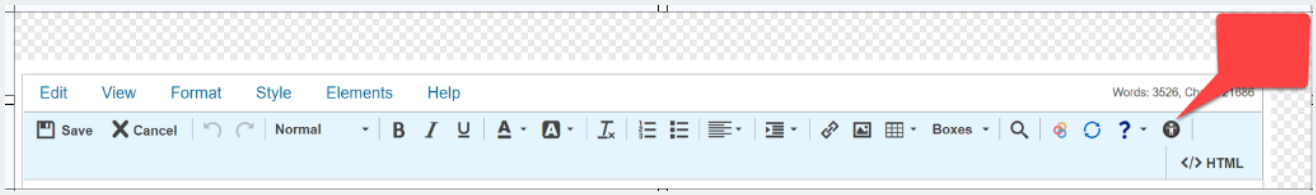
The colors are associated with code in the HTML for screen readers.

This page titled 3.7: Adding Predefined Template Code (e.g., Boxes) is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

3.8: Accessibility Checking

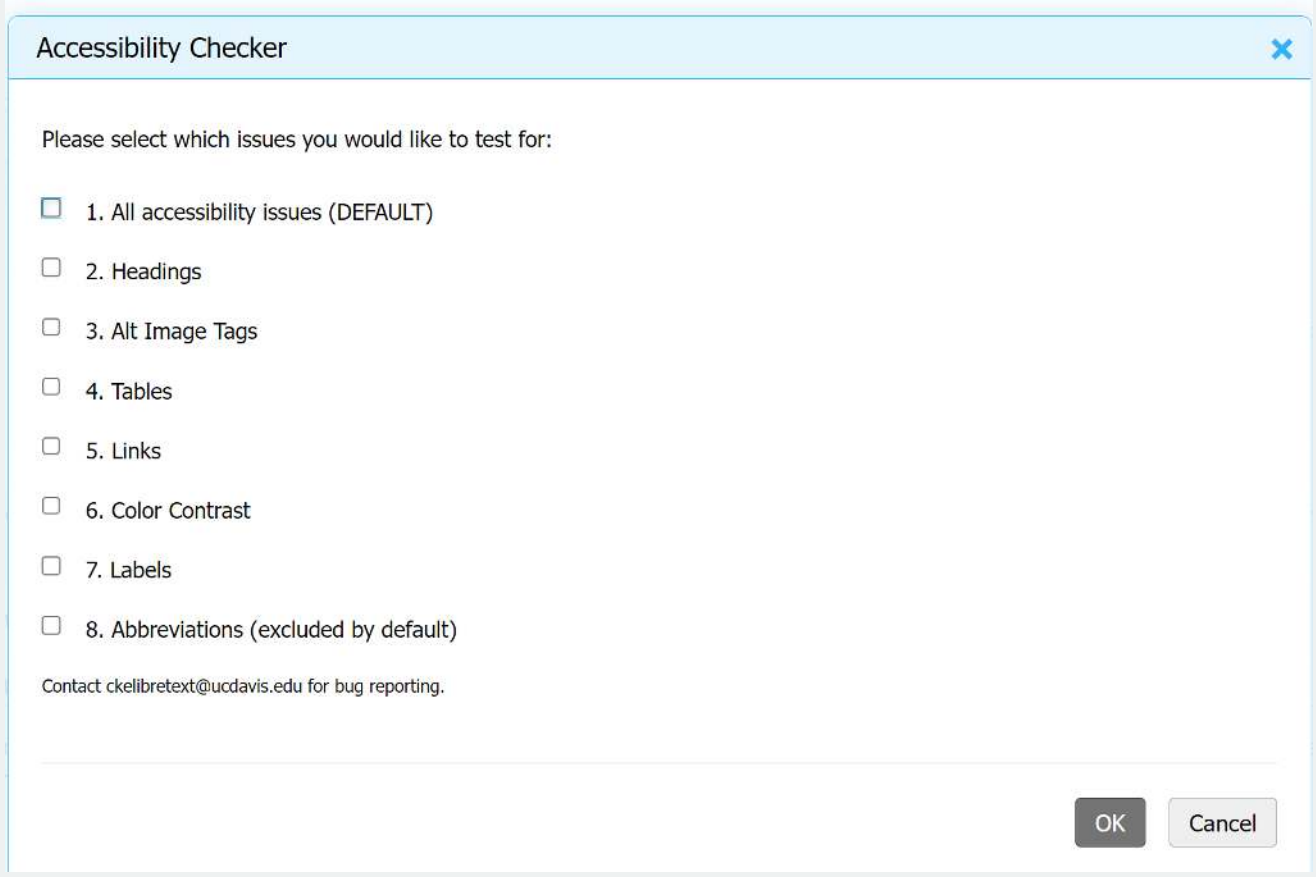
LibreTexts provides tools in it's CK Editor to do preliminary peer reviews.

Accessing Online Automated Accessibility Checker



and by selecting this symbol you can choose the issues you want the CK Editor Accessibility Checker to look for

Select Accessibility Issues to Be Checked



Once this is done you can look at (and fix) the accessibility issues on the page. The Quick Fixes are suggestions that you may or may not want to accept.

Accessibiilty Issues

Save Cancel Normal Boxes HTML

The same calculation can also be done in a tabular format, which is especially helpful for more complex molecules:

2C	(2 atoms)(12.011 amu/atom) = 24.022 amu
6H	(6 atoms)(1.0079 amu/atom) = 6.0474 amu
1O	(1 atoms)(15.9994 amu/atom) = 15.9994 amu
C_2H_6O	molecular mass of ethanol = 46.069 amu

Exercise

Calculate the molecular mass of trichlorofluoromethane, also known as Freon-11, whose condense
recently, it was used as a refrigerant. The structure of a molecule of Freon-11 is as follows:



Freon-11, CCl_3F

Answer: 137.368 amu

Note the Pattern

Atomic mass, and molecular mass have the same units: atomic mass units.

Accessibility Checker

Issue 6 of 33 (error)

Data tables should contain a "caption" element if not described elsewhere

Unless otherwise described in the document, tables should contain `caption` elements to describe the purpose of the table.

Caption:

Quick fix

Contact ckelibretext@ucdavis.edu for bug reporting.
If the quick fix button doesn't show up, please refresh the page.

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3.9: Selecting Copyright for Page (Meta-Tags)

Each page should be marked with a copyright. This can be selected via the "Licensing" meta-tag in the collapsible "Page setting" panel on each page (see below).

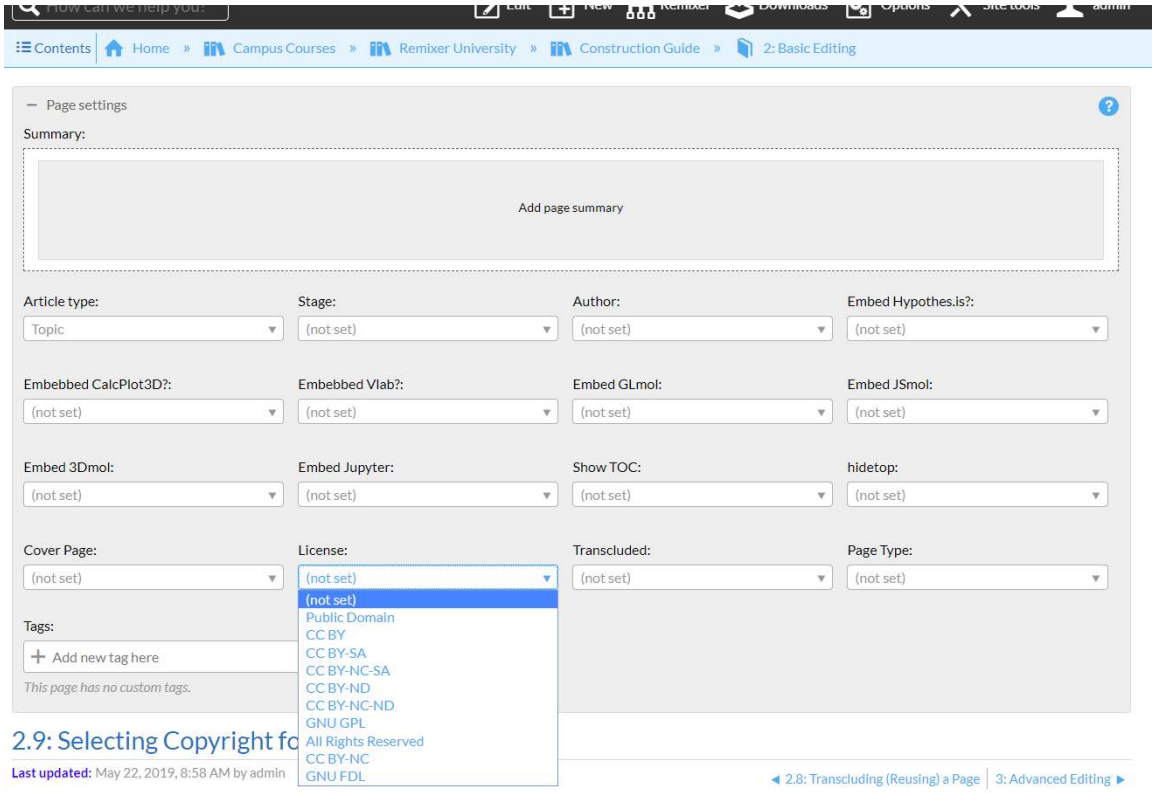


Figure 3.9.1: Full page settings for Chemistry library. Each library has a different set of meta-tags. The licensing options for pages are selected via a pull down menu.

Selecting the appropriate license requires more discussion about the nature of the license.

Creative Commons Licensing

The Creative Commons licenses are the most ubiquitous licensing in OER and grant "baseline rights", such as the right to distribute the copyrighted work worldwide for non-commercial purposes, and without modification. The details of each of these licenses depend on the version, and comprises a selection out of four conditions shown below.

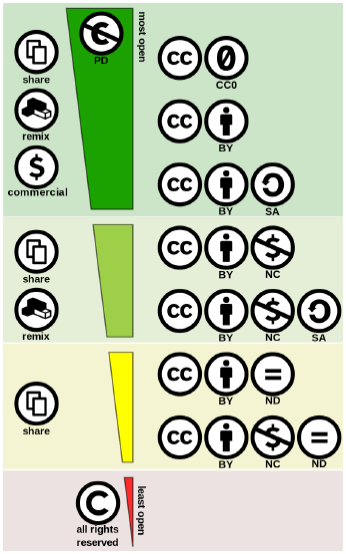


Figure 3.9.2: Creative commons license spectrum between public domain (top) and all rights reserved (bottom). Left side indicates the use-cases allowed, right side the license components. (CC BY 4.0; Shaddim; original CC license symbols by Creative Commons).

Other Licensing Options

Other licensing is possible including the GNU General Public License (GNU GPL) the GNU Free Documentation License (GNU FPL). These are less common licensing in OER.

CC Licensing

Creative commons licenses are built in the following way.

First use CC - to indicate that the material is covered by a Creative Commons copyright, then use one or more of the following to indicate further restrictions

CC- 0 means that the material is public domain and there are no conditions

BY means that the author much be acknowledged, if this is the only condition then the copyright would be CC-BY

SA means that if the work is shared the conditions must be the same as the original. One could have CC-SA. CC-BY-SA is a common license

NC meant that only non-commercial use of the work is permitted.

ND means thar no changes can be made in the material.

Cannot ARBITRARILY Mix and Match Content from Different Licensing

Rights in an adaptation can be expressed by a CC license that is compatible with the status or licensing of the original work or works on which the adaptation is based.

License compatibility chart for combining or mixing two CC licensed works

	Yes	Yes	Yes	Yes	No
	Yes	Yes	Yes	Yes	No
	Yes	Yes	Yes	No	No
	Yes	Yes	No	Yes	No

	No	No	No	No	No

NO-Derivative content

Avoid adding any content into the Libretexts that has a ND license on it. These do not play well with the community remixing aspect of the LibreTexts project. There are a few texts with this annoying license on the platform, but not many.

This page titled 3.9: Selecting Copyright for Page (Meta-Tags) is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

3.10: Adding Authorbars (Meta-Tags)

Attribution is important for both academia and for most open licenses in OER. At present, to ensure proper credit is given and that any attribution requirements for licensing is satisfied, the LibreTexts libraries are equipped for adding an author bar to each page. This is added via the meta-tags "Author" option in the collapsible "Page Settings" option of each page (Figure 3.10.1). For example, the author bar for "Delmar Larsen" is indicated on this page (see above). New author bars can be created by the LibreTexts development team as needed/requested.

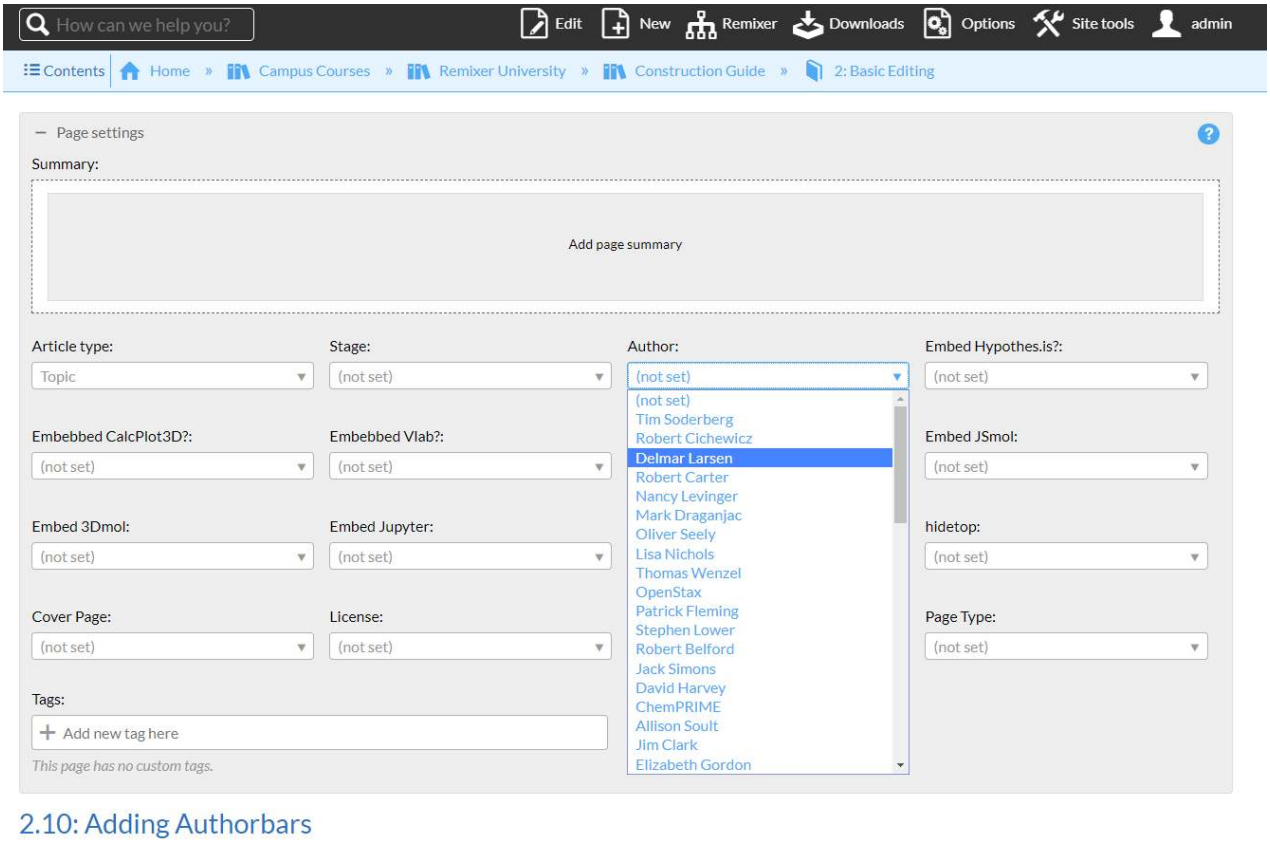
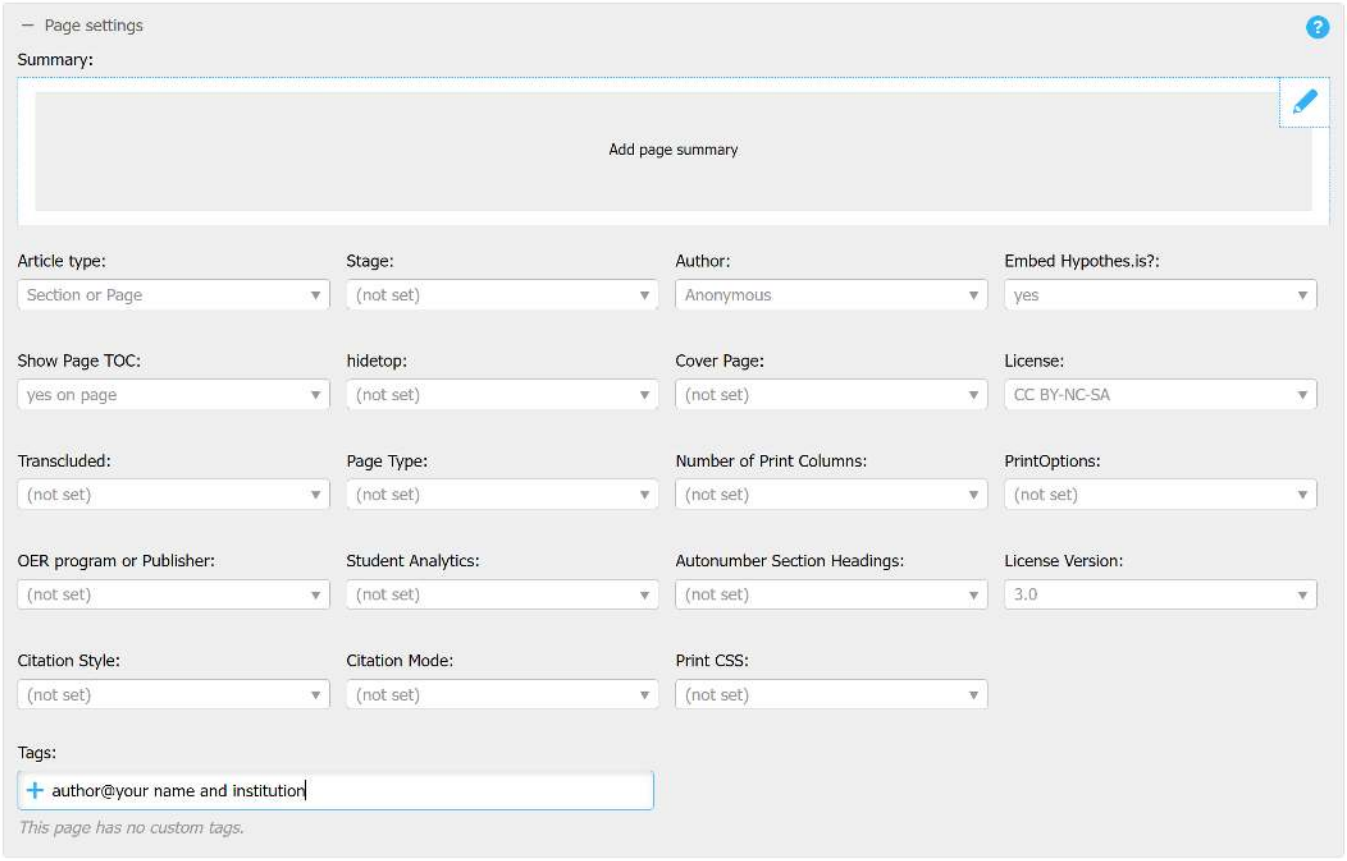


Figure 3.10.1: Author options on the Chemistry Library.

Not found?

If an author is not found in the available option contact the LibreTexts Development team to add it via info@libretexts.org.

For OER the question arises about how to credit pages which have been edited. There are two ways, the first is to add a metatag in the page settings author@Your Name and Institution



after you hit return you will see a line added at the bottom of the page

Chapter 1.1: Chemistry in the Modern World is shared under a CC BY-NC-SA 3.0 license and was authored, remixed, and/or curated by your name and institution.

You should also indicate the author of the page before it was remixed.

The second is to add text at the end of the page

Contributors

- Anonymous

Modified by Joshua Halpern (Howard University)

This page titled 3.10: Adding Authorbars (Meta-Tags) is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

3.11: Page Titles

I wanted to mention the title format that we have adopted on the LibreTexts for pages. Unless impossible to do, it is desired that each page be formatted like this

"XX.YY: title"

where

- **XX** is the chapter number
- **YY** is the section number
- **title** is the page title

If the title has a colon in it (other than the colon after the chapter.section combo), please convert it to a dash.

Several exceptions to this format include:

- **Chapter Summaries**: "XX.S: Chapter Title (Summary)"),
- **Chapter Exercises**: "XX:.E Chapter Title (Exercises)" and
- **Section Subpages** (avoid if possible), which should be then indicated by adding a letter (alphabetically). e.g., "4.3A: Cats are cute" and "4.3B: Dogs are cute" are both subsections to section/page "4.3: Animals are cute"

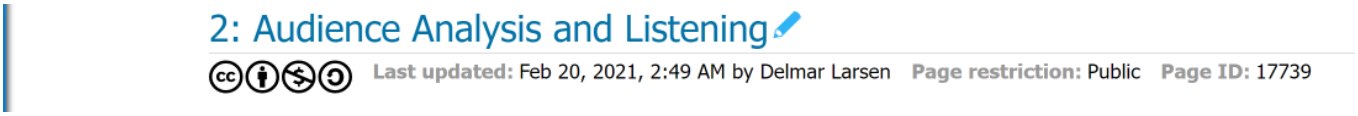
This approach preserves the curation and Remixing ability of the pages. It also preserves the automatic equation/figure/table numbering that uses the title of the page.

As an example of this approach, here is a snippet of the organization of a Bio text:

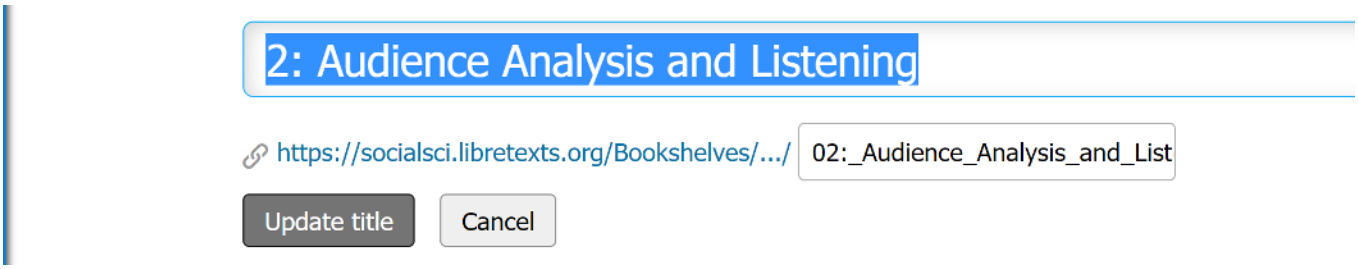
BIS 103: Bioenergetics and Metabolism (Callis)

- 1: Introduction to Metabolism
  - 1.1: Bioenergetics and Thermodynamics
  - 1.2: Chemical Logic and Common Biochemical Reactions
  - 1.3: Phosphoryl Group Transfer and ATP
  - 1.4: Biological Oxidation-Reduction Reactions
- 2: Carbohydrates and Catabolism of Carbohydrates
  - 2.1: Carbohydrates- structure and diversity in biology
  - 2.2: Catabolism of glucose-glycolysis as the first pathway tells us about some general metabolic principles
  - 2.3: Catabolism of other sugars- organisms can catabolize sugars other than glucose
  - 2.4: Polysaccharide Catabolism
- 3: The Citric Acid Cycle
  - 3.1: Introduction to decarboxylation of acids- comparing PDC and PDH
  - 3.2: TCA cycle
  - 3.3: Functions of TCA cycle- catabolism and anabolism
- 4: Carbohydrate Synthesis
  - 4.1: Gluconeogenesis
  - 4.2: Synthesis of di-saccharides and polysaccharides

If, when you are logged in and looking at a page for which you have editing right, when you move the mouse to the title line at the top you will see a pencil at the far right hand side



If you select the pencil you will see a dialog



The top line is the Title of the page and can be changed as you will. The number, which can be X, or XX or XX.YY interacts with $PageIndex$ numbering. The second line is the system URL for the page. Sometimes this is grayed out, and will change when you change the Title line. As you can see here, the URL starts with 02: but the Title with 2: The reason for this is that if the URLs are a single number, and there are more than 9 of them, the URL starting with 10, 11, etc, will go before those starting with 1, 2, 3, etc. and you may have to use the remixer, or change the URLs by hand.

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3.12: Adding Summary

In the Page Settings of each LibreTexts page is a summary block that will accept approximately three lines of text (Figure 3.12.1). Think of the summary as a tweet (like on Twitter) on the subject of the page. It is almost the same length as a tweet and has a similar impact.

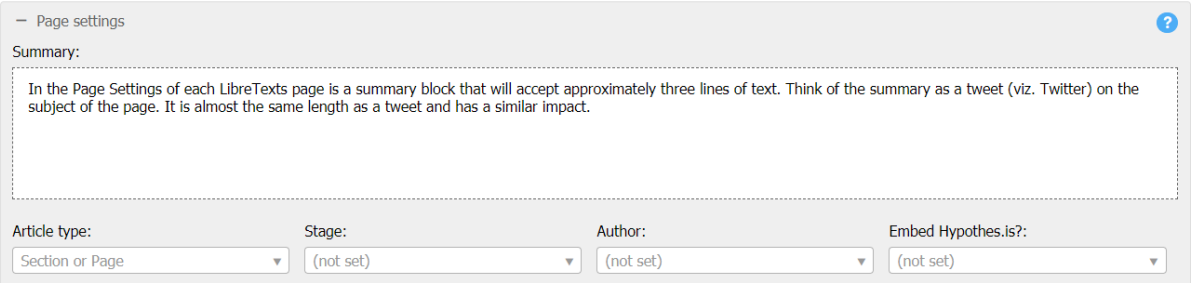


Figure 3.12.1: Summary block in the Page Settings of this page.

Adding a Summary to a page is not necessary; you and your text can live without them if you like. However, they are beneficial in several ways:

1. If you do a search on our platform, the summary will show up next to the page to help searchers identify the page(s) that best addresses their search
2. The summaries of Sections (on pages of content of a text) will show up on the Table of Contents (in Chapter Overview) in PDFs and on chapter pages when viewed online (Figure 3.12.2).
3. The summaries of Chapters will show up in the Table of Contents in PDFs and if you hover your mouse over the chapter thumbnails of a textbook.
4. The summaries are also used by Google to aid in search results to guide traffic to your texts (i.e., Search Engine Optimization).

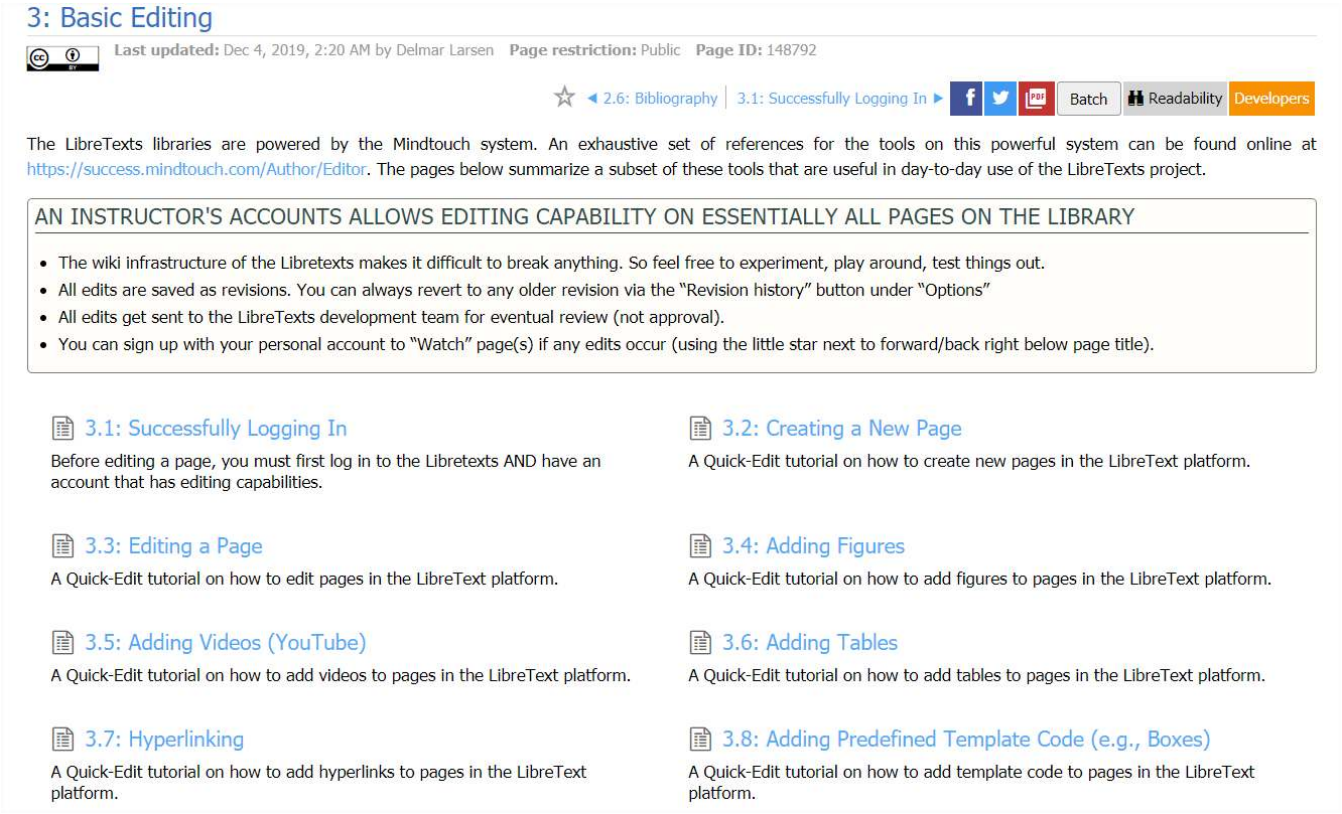


Figure 3.12.2: Copy and Paste Caption here

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3.13: Watching, Rating, and Providing Feedback for a Page

While the LibreTexts team has a curation sub-team that cultivates the content on the library (in coordination with contributing authors), community curation is also a key aspect in keeping our content "living" rather than stagnating (e.g., in a dead format). There are three key aspects to facilitate: Watching pages, Rating Page, and providing Feedback on Pages.

Watching Pages

1. Navigate to the page you want to subscribe to.
2. Click the **Page Notifications** (star) icon in the upper right-hand corner of the page and select the appropriate radio button to set your subscription.

If you are on a Category or Guide page and want to receive notifications on all content in that Category or Guide, select the option for **This page and all subpages**. To subscribe to all content on your site, navigate to each top-level Category or Guide from your homepage and subscribe to all subpages.

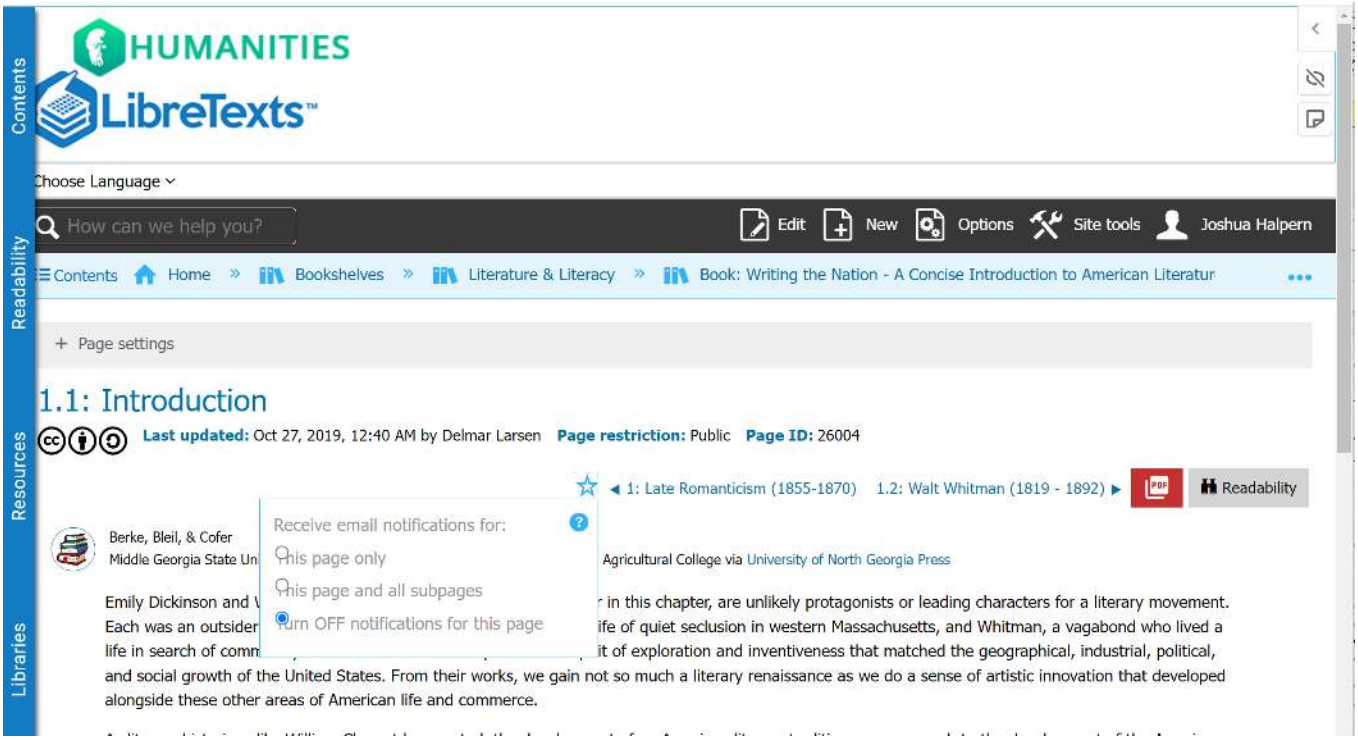


Figure 3.13.1

Rating Pages

Article ratings and feedback enable users to indicate if an article was helpful or not and provide optional comments. To rate an article go to the bottom of the page and click either **Yes** (smiley face) or **No** (sad face) to indicate if an article was helpful or not. Logged in users can also select **Leave Feedback** to include a comment and indicate their preference to be contacted regarding their feedback.

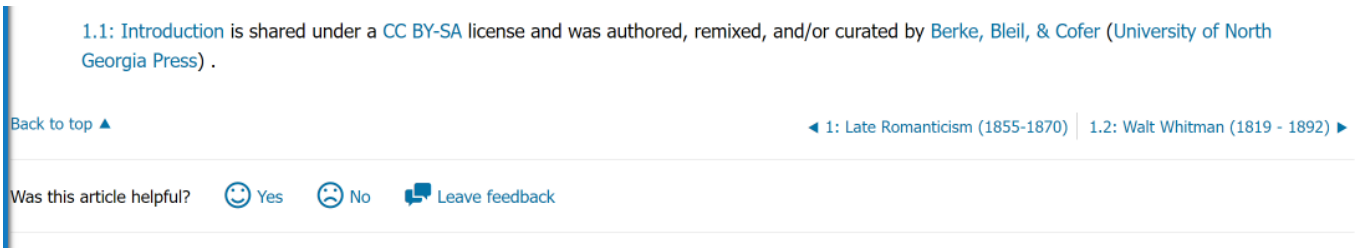




Figure 3.13.2

Feedback on Pages

Feedback is only enabled for logged in users to prohibit spam bots from submitting feedback. Emails are sent to the development team and then addressed at that level or forwarded to the relevant curators.

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3.14: Image Resources

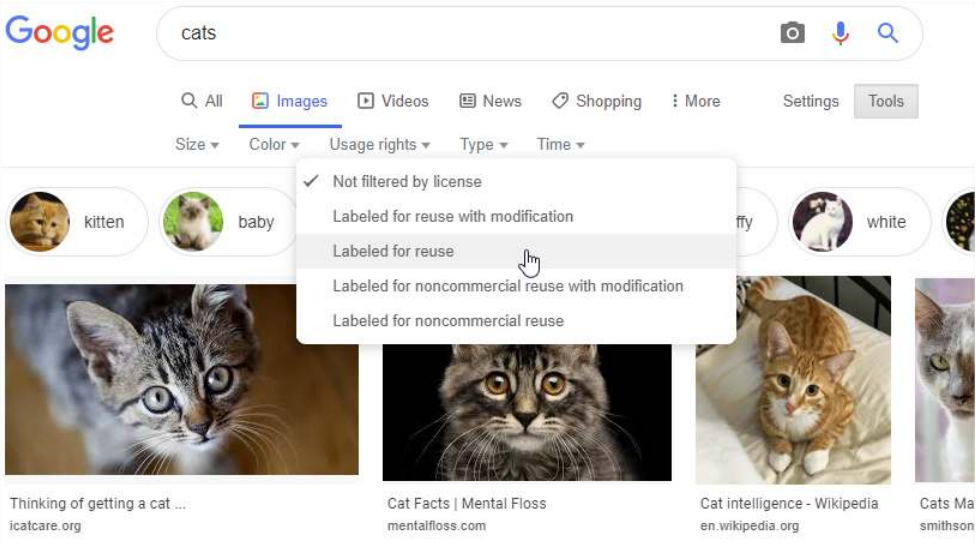
Images Repository

These are resources for open or copyright-free or openly licensed images that can be used, especially for thumbnails.

- https://unsplash.com/
- www.pexels.com
- pixabay.com/
- The Gender Spectrum Collection by Broadly
- https://www.flickr.com/photos/nihgov/albums
- https://freestocks.org/

There are several sources on the Internet for openly licensed images for embedding into LibreTexts Pages:

- For more specific images, consider Wikipedia and Flickr (but pay attention to license on the latter).
- Editors can do an image search on Google images and click on the filter for "reuse". See the image below. However, do not trust this. You should confirm the license is open irrespective of what Google thinks.



This page titled 3.14: Image Resources is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

CHAPTER OVERVIEW

4: Advanced Editing

4.1: Transcluding (Reusing) a Page
4.2: Forking a Transcluded (Reused) Page
4.3: Editing a Transcluded (Reused) Page
4.4: Adding Automatic Organizations and Thumbnails
4.5: Adding and Editing Equations
4.5.1: Equation Formatting Conventions
4.6: Adding Alt-Texts
4.7: Front and Back Matter
4.8: Compiling, Batching, and the Download Center
4.9: Accessibility Checker in the Editor

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4.1: Transcluding (Reusing) a Page

Our transcluding video tutorial on YouTube: youtu.be/Ef5HjZ6ogGc

One of the powers of the LibreTexts Bookshelves/Course Shell system is to share content without having to copy it. Content can be added to new pages in two ways: copying (also called "forking") and transcluding (also called "reusing"). The former is the typical copy and paste approach and effectively creates two copies of content that can be independently curated. This is useful for deviating the content from the original source. However, often the content may not need to be changed at all, and in this case, transcluding the content is ideal.

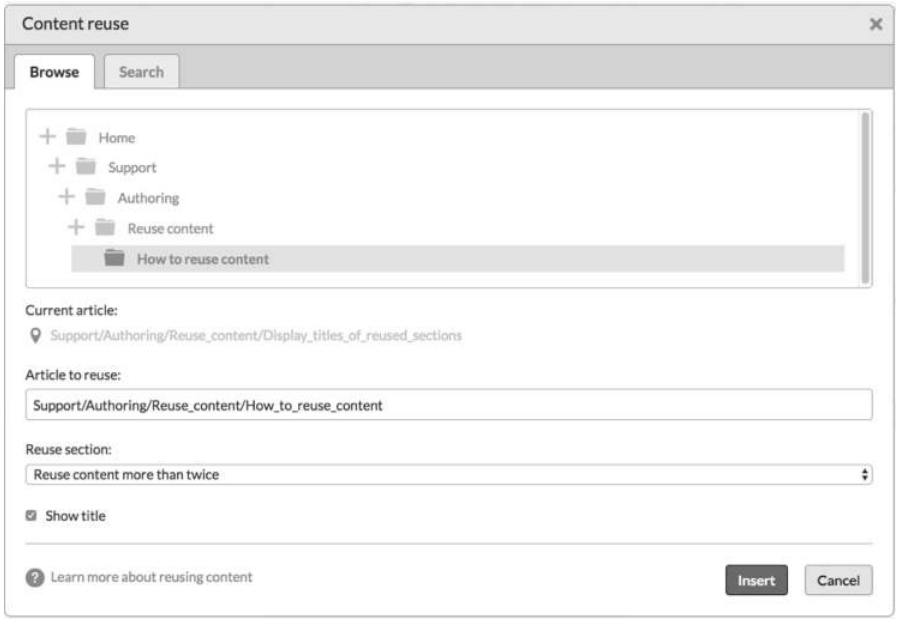
Transcluding content keeps the content from the source page, and only mirrors this content to the new page. This helps to reduce clutter and facilitates effective curation of the libraries, a key aspect of the LibreTexts project. This is because typos can be changed in the source and these will immediately be updated in all transcluded pages as well.

Note that the section labels (e.g. Figure 11.2.4) will be updated in the transcluded pages based on the number given first in the transcluded page's title. So even though the content is mirrored from the original source, the section appears to fit seamlessly into other LibreTexts.

The remixer transcludes all content automatically by default and if you wish to change/edit the content you will fork it to produce a copy.

How to Transclude

1. Navigate to the page on which you want to reuse content and open the page in **Edit** mode.
2. Select **Elements** > **Content reuse** from the Editor toolbar.
3. Use the **Browse** or **Search** tab to select your source page to appear in the **Article to reuse** field.
4. Specify how much content you want to reuse:
   - **To reuse the entire page**, leave the **Reuse section** unselected.
   - **To reuse only a section of a page**, select the appropriate section from the **Reuse section** drop-down list. If reusing a section, the entire section will be reused, including any subsections. To include the title of a section, select the **Show title** checkbox.
5. Click **Insert**.



6. Save the page to see your published content reuse.
7. After you create a transcluded page in this way, it is a good idea to flip the "Transcluded" meta-tag under the page settings at the top of the page (often collapsed) to "yes".

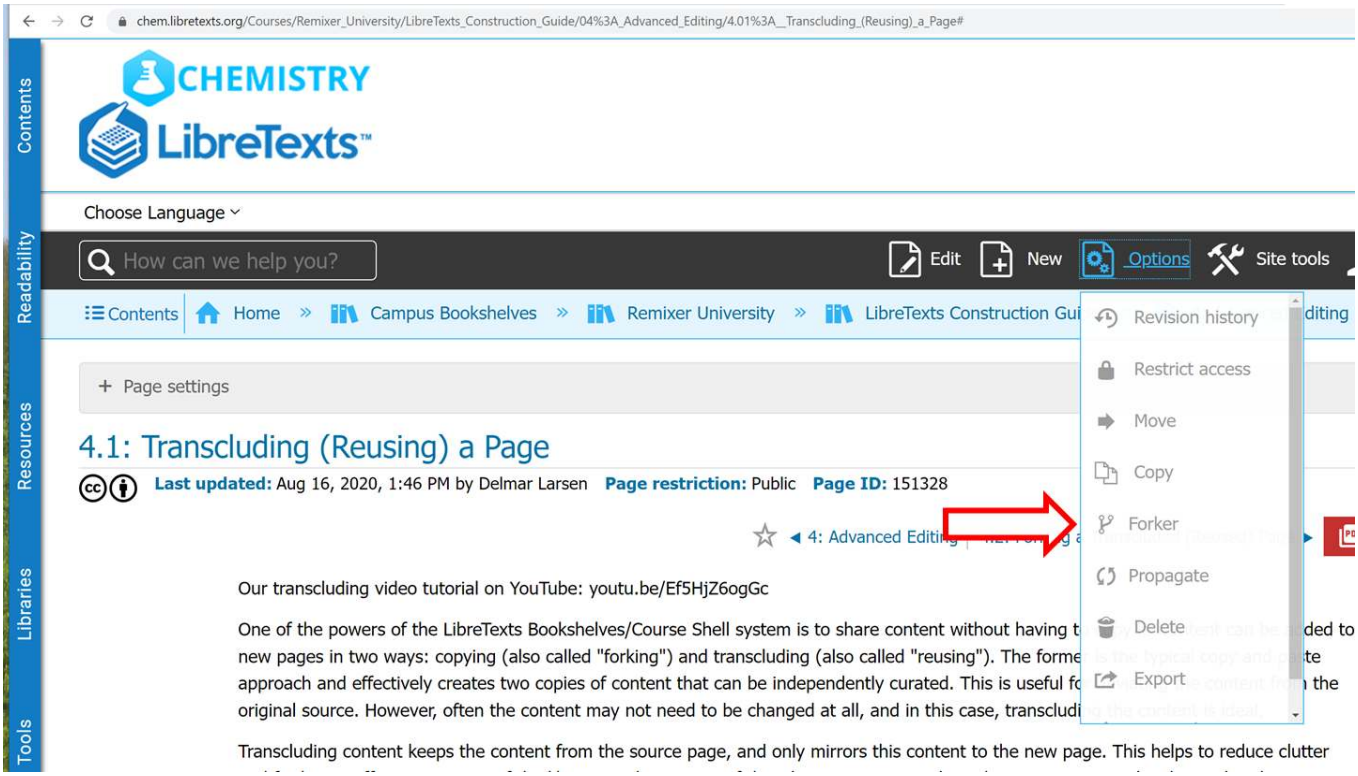
From the perspective of the student reader, the difference between traditional copying (forking) and transclusion (reusing) is impossible to tell.

Best practices

It is best to transclude all content when a new text is created by remixing existing content UNLESS a specific need arises to edit the content. And this customization can be done one section at a time.

How to switch Transcluded content into Forked Content

A transcluded page can be swtiched to a forked page by clicking on the Forker option under page options. Alternatively, if the meta-tag is set on a trancluded page, there is a forker icon next to the title that will do the same thing.



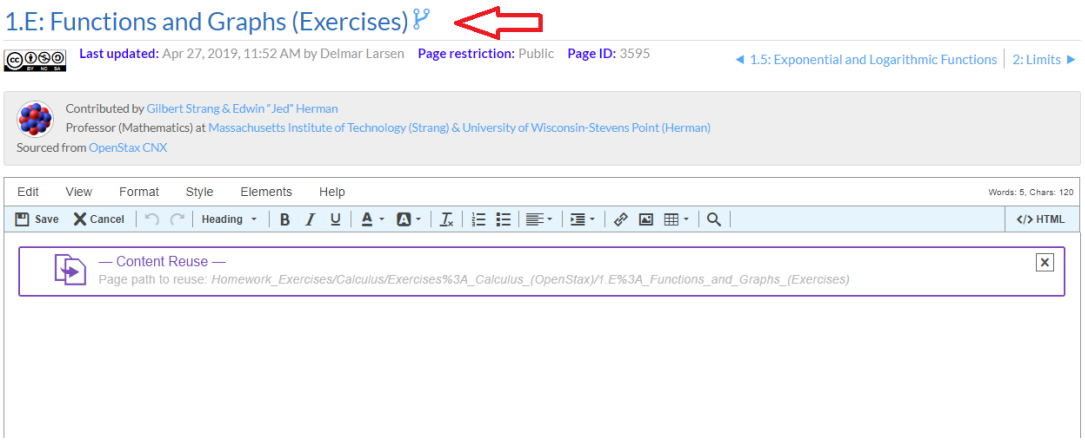
This page titled 4.1: Transcluding (Reusing) a Page is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

4.2: Forking a Transcluded (Reused) Page

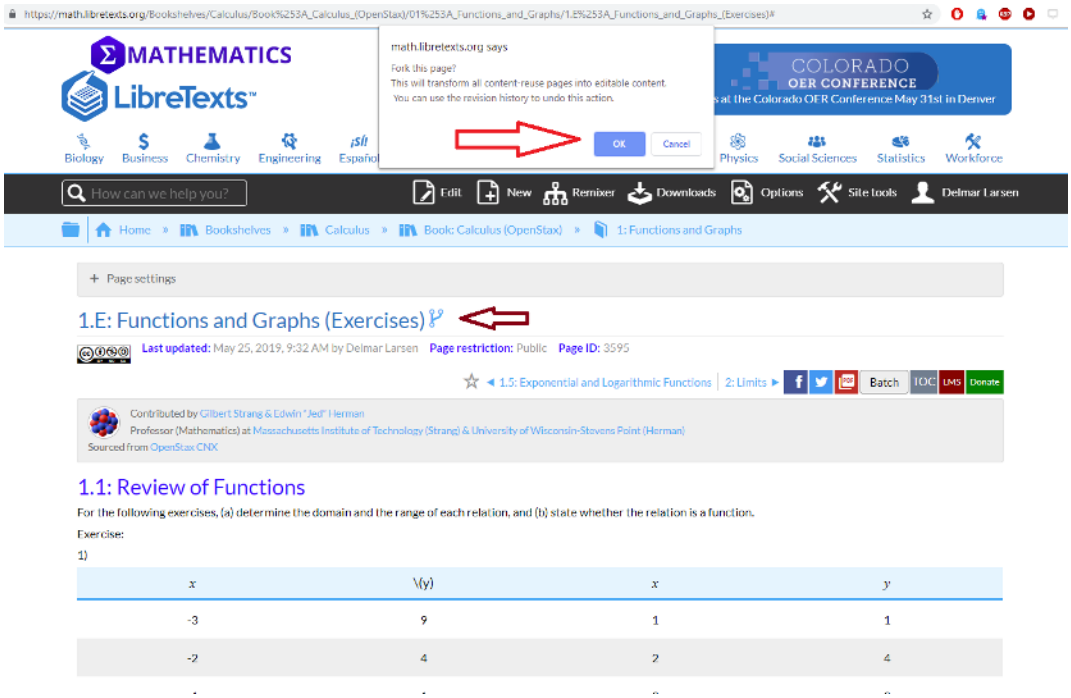
In general, there are two types of editing: Editing for customization of the page for your book and editing to fix an error/mistake. The former requires "forking" the page and the latter requires finding the original page to edit (discussed next section). Which approach to take depends on which category your edit(s) fall into. The former is address in this page and the latter requires editing rights to the source, which can be provided as long as you are willing to curate for the library and the users that use the content.

A **transcluded** page can be converted to a **normal** editable page with a copy of the content from the mirrored page by "forking" the page. Since transcluded pages are the default for the OER Remixer, this is a useful activity for editors of the library. Let's consider the first chapter's exercise set in the OpenStax Calculus text.

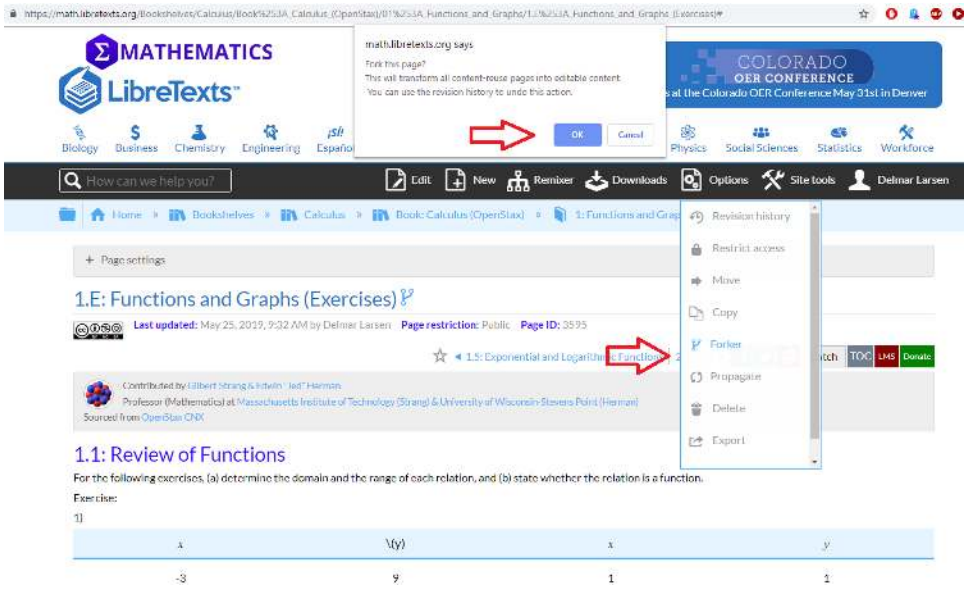
If the transcluded page is tagged properly, there will a "forker" icon next to its name as shown below.



If you press that icon (and it may not exist), a window should pop up that lets you ":fork" the page (copy the source content from the source pages into the translcuded page). This effectively removes the trancluded nature of the page and make it a customizable/editable page.



If that icon is not on the title, the forker can be accessed via the the "Options" pull-down menu on the black bar. This will open up the same popup window with the same effect.

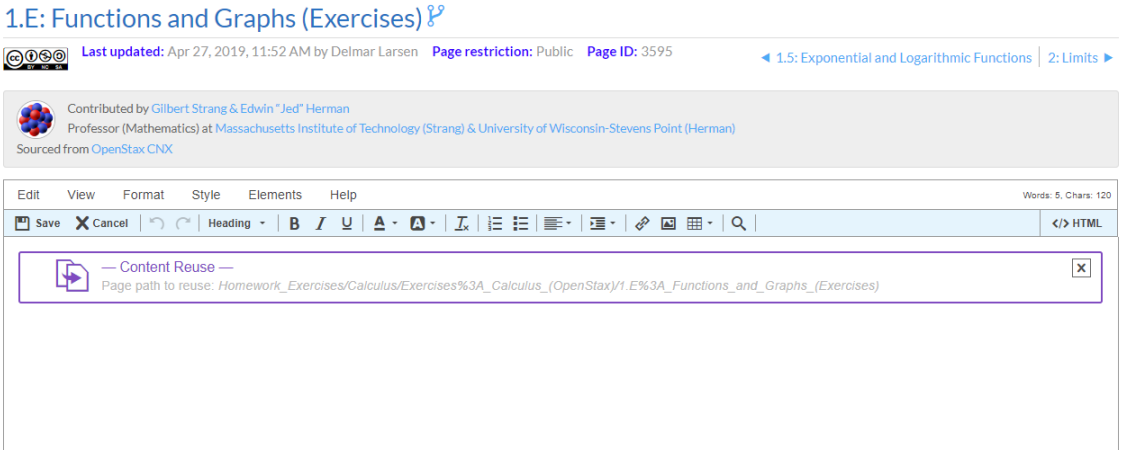


As with all edits, the effects of forking can be undone by going to the "Revision History" option under the same "Options" pull-down menu and reverting to the previous version of the page.

This page titled 4.2: Forking a Transcluded (Reused) Page is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

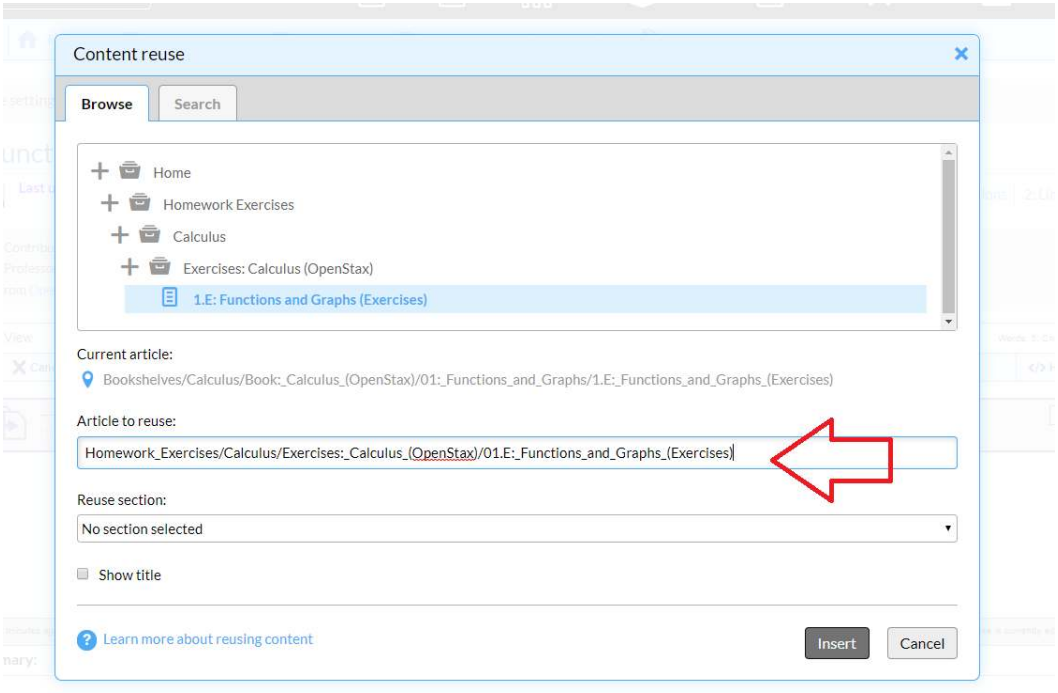
4.3: Editing a Transcluded (Reused) Page

Sometimes in editing pages on the Library, a page will be edited and it may look something like the page shown below for the first chapter's exercise set in the OpenStax Calculus text.

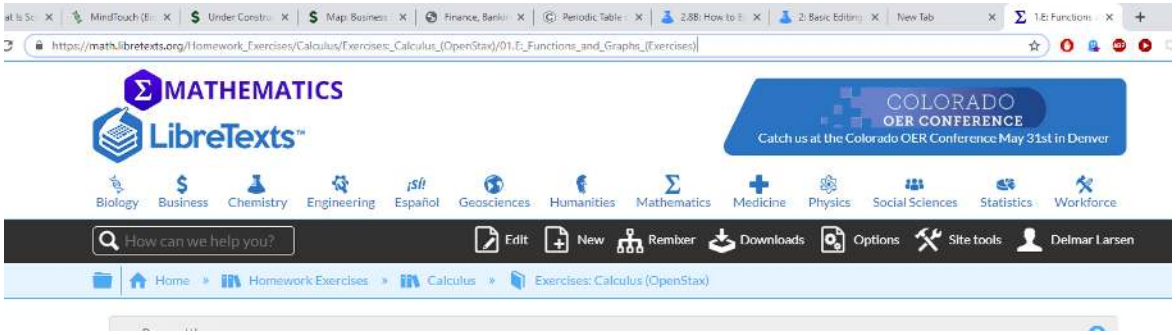


This is a transcluded page like the procedure outlined in Section 2.8. To edit the content on this page (to fix a typo or incorrect image, etc.), the source page must be located and edited directly. If you are not the textbook's author, remember to only fix errors on the original source pages and only customize pages that are located in your school's Course Shell.

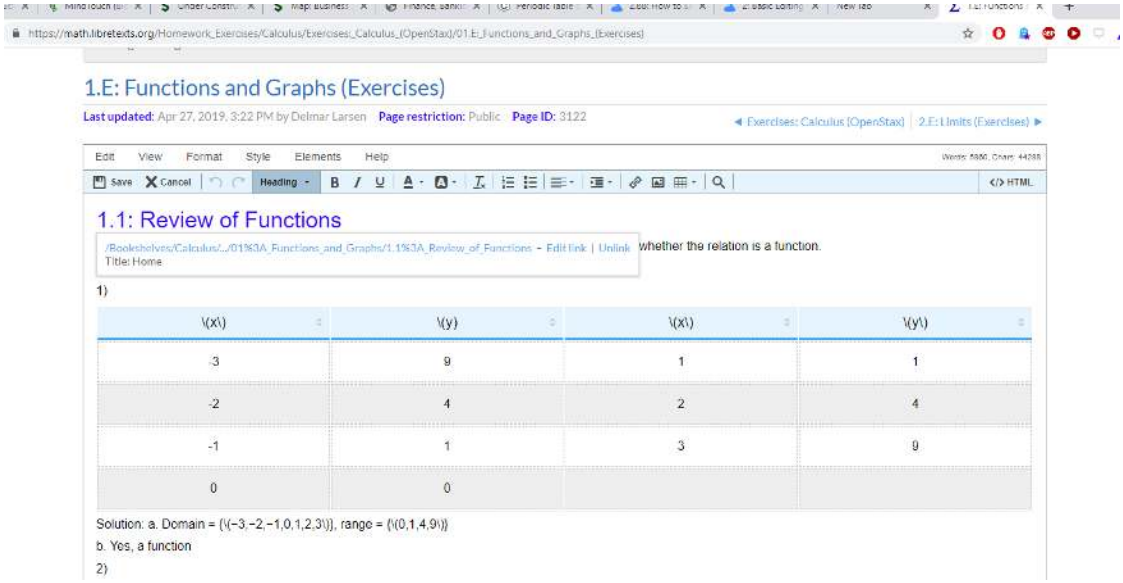
To quickly navigate to the corresponding source page to edit it, double click on the purple "Content Reuse" box and a Content Reuse window will pop up.



Copy and paste the URL in the "Article to reuse" which is the source page. Then paste it in the URL wtih the after appending it to the name of the library (Math library in this case).



When the new page (source) opens up, you can edit it as with other pages. Any edits on this source page will be reflected on the transcluded page as well, once it is refreshed.



This page titled 4.3: Editing a Transcluded (Reused) Page is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

4.4: Adding Automatic Organizations and Thumbnails

A common template used in the LibreTexts is the portfolio template that is used to make a dynamic, all-inclusive and easy to maintain table of contents of all daughter pages. For example, adding the text

```
{{template.ShowOrg()}}
```

on a page will make up the following 2-by-n organization with each daughter page associated with a thumbnail image.

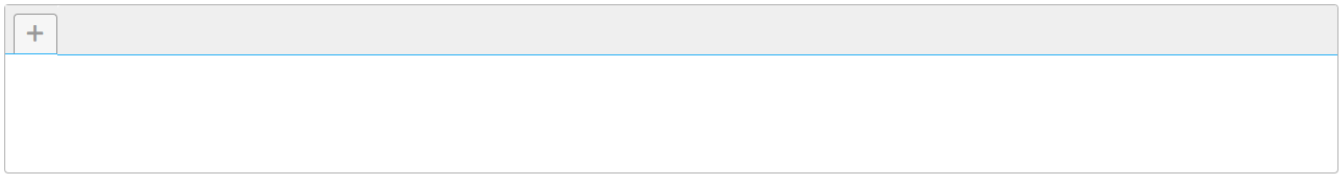
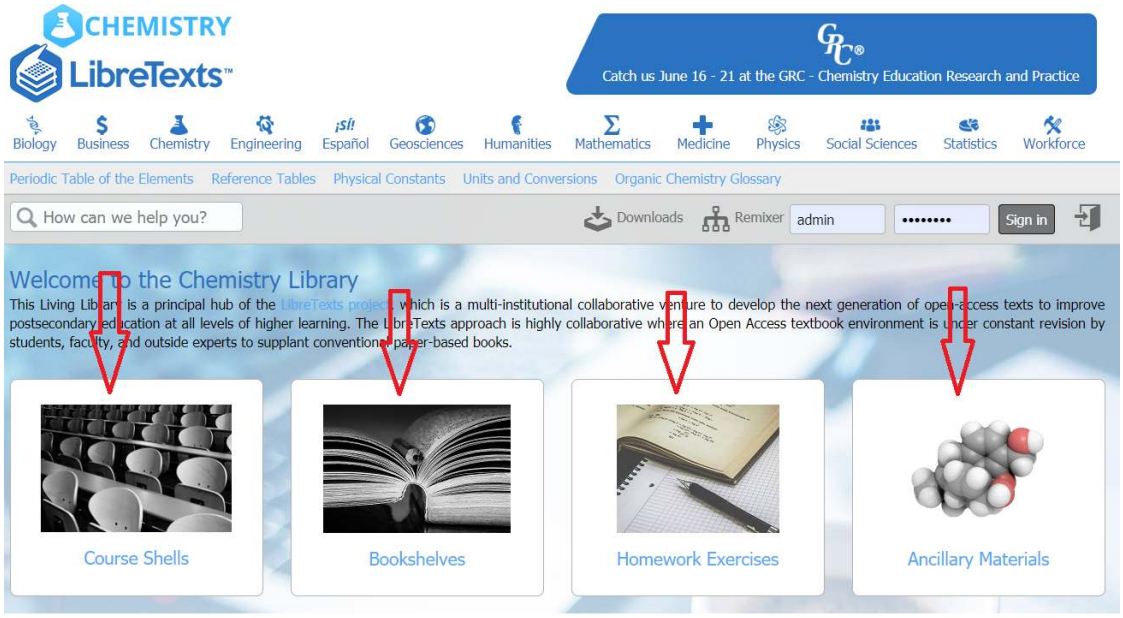


Figure: Portfolio template with thumbnails for the LibreTexts section

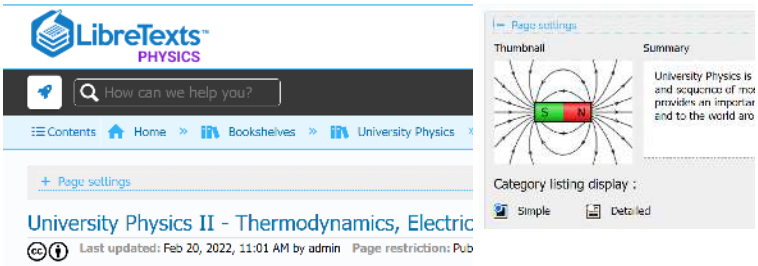
Thumbnails

A page thumbnail is an image you can add to any article that will automatically show up after using the **ShowOrg** template discussed above (red arrows below).

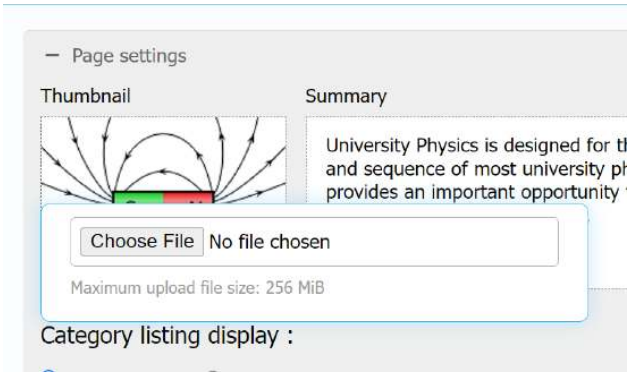


Steps to add a thumbnail image to a page:

- Step 0: Log in as an Instructor and go to the Book or Chapter you want to add/change the thumbnail
- Step 1: The page must be classified as "Book/Unit" or "Chapter" not "Section/Page" (refresh page if you switch it)
- Step 2: The "page setting" grey bar just above the page title will need to be clicked if you don't see all the choices



- Step 3: The box at the upper left in the should say "Thumbnail" and if you hover over it you will see a little blue pencil in its upper right hand corner. Click that.
- Step 4: Now click "Browse" to select the image file from your file system.



Thumbnails

Images should be prepared with a height of 250 pixels. You can do this with Windows Paint or appropriate UNIX or Apple tools. Large thumbnails slow dow page loading and hog storage

To remove a page thumbnail, hover over the thumbnail image in Page settings and click the Delete (X) icon.

All thumbnails should be openly licensed. Two sources are pixabay.com and pexels.com

Page Ordering

The LibreTexts platform uses a semantic system for the URLs of pages based on the title of the page. Hence, URLs are not a string of nonsensical numbers and letters but tell users exactly the page's hierarchy in the greater Library's hierarchy. For example, chapter 2 of Prof. Robert Belford's General Chemistry text shown below has a title of "2: Atoms, Molecules, and Ions" and the full URL (not fully resolved) is: "https://chem.libretexts.org/Courses/University_of_Arkansas_Little_Rock/Chem_1402%3A_General_Chemistry_1_(Belford)/Text/2%3A_Atoms%2C_Molecules%2C_and_Ions".

This is long, but the organization is clear.

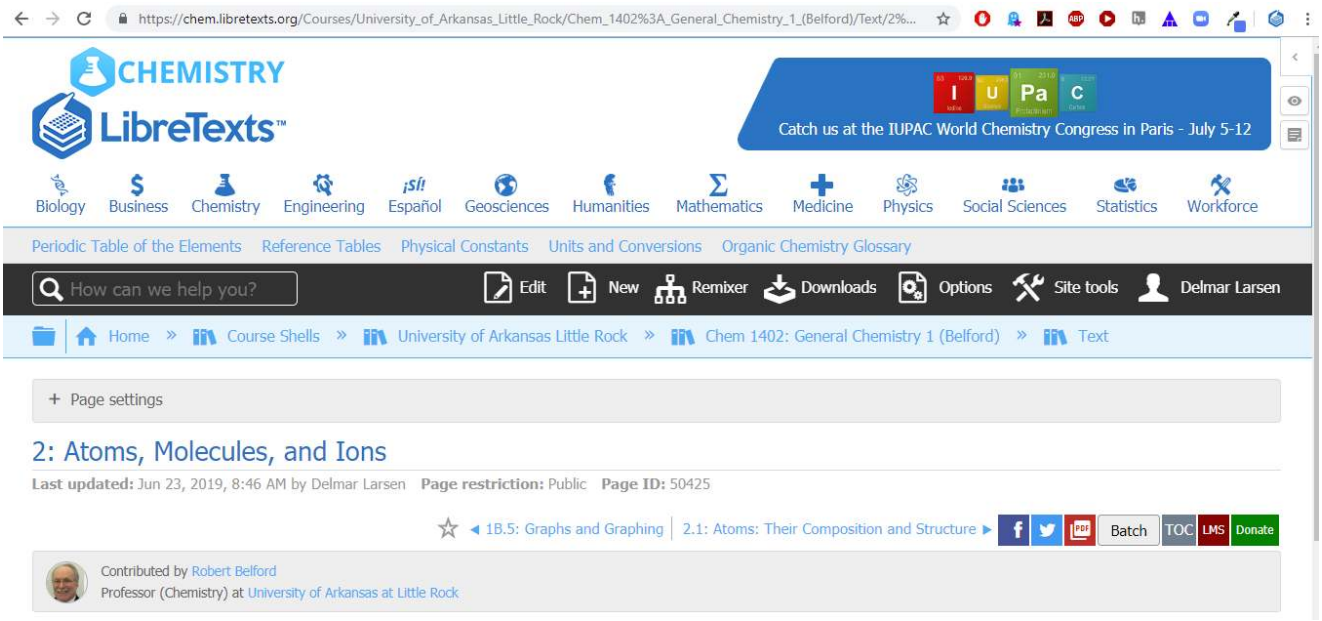


Figure 1:

One aspect of linking titles and URLs is that the order in which the pages are shown is based on the title. So simple numbering schemes that are used in the library (e.g., "2.2: Atomic Number and Atomic Mass Unit") that start with "number: title" require a bit of effort to be shown in the correct (numerical) order. This is because the title "2.12: Hydrates" comes before "2.1: Atoms: Their Composition and Structure".

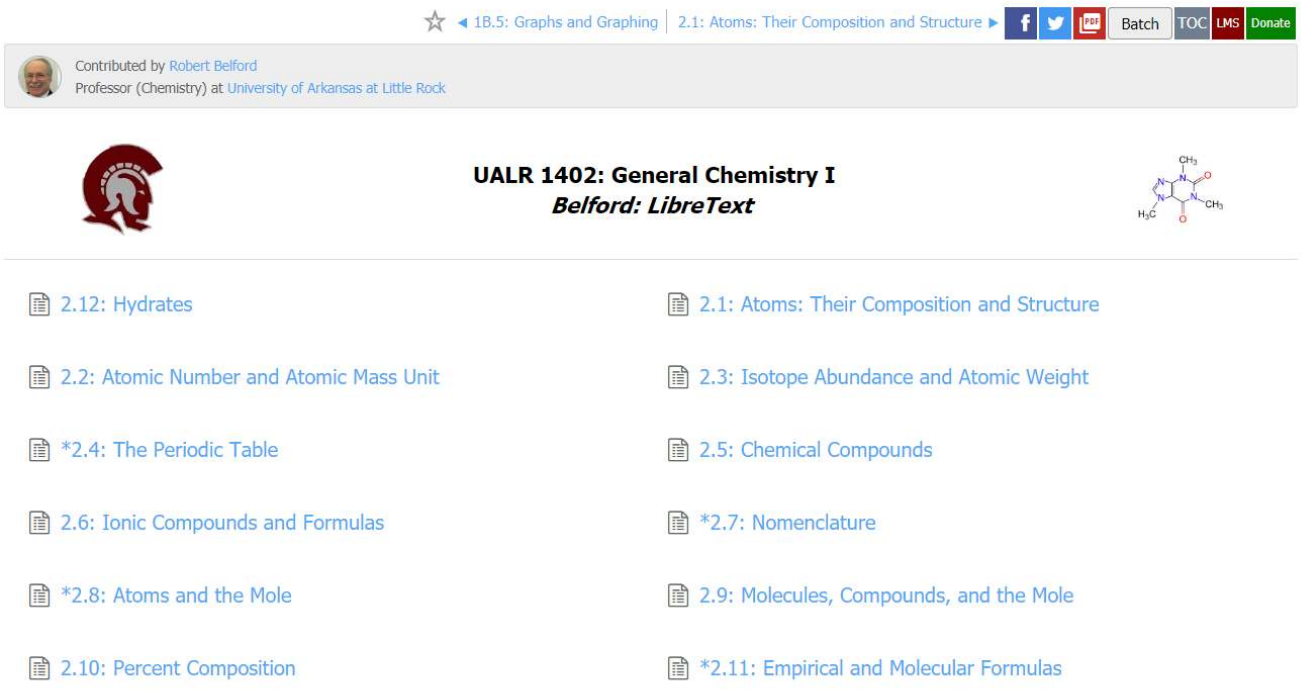


Figure 2

For the presentation of the pages on the Chapter page, the order is based on the URL not the title, so the URL for this page must be changed (and preferably not the title). To fix this, each page with a title that includes the single digit prefix numbers (i.e., 0-9) must be edited slightly to "uncouple" the title from the URL. This is done via the pencil option used to edit the title of any page. For example, for the page "2.1: Atoms: Their Composition and Structure" page shown above, if a user (with editing privileges) clicks on that page and hovers the mouse over the title, a little pencil pops up next to the title that when clicked expands the title section like in Figure 3.



Figure 3

This expansion gives users control of the page title, but also the URL. Again, the default is that they are linked together, but can be uncoupled via the "link" button on the side of the grayed-out URL. This grays out the link and now the URL and title can be independently edited (Figure 4).

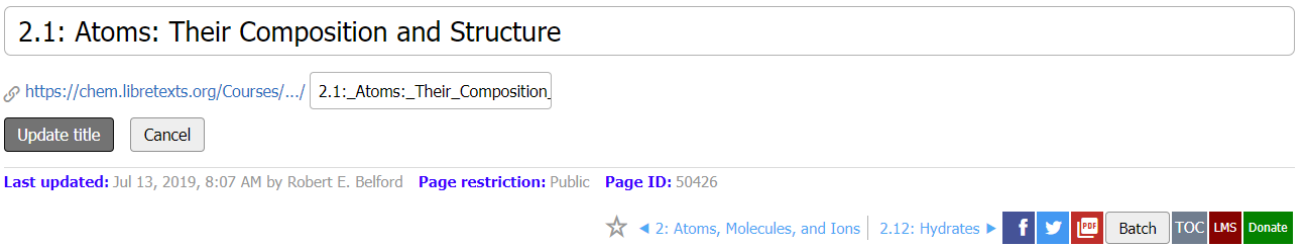


Figure 4

Back to the goal, which was to reorder the pages in proper numerical order. The prefix number for this page's URL is then converted to a two-digit number by adding a zero in front (Figure 5).

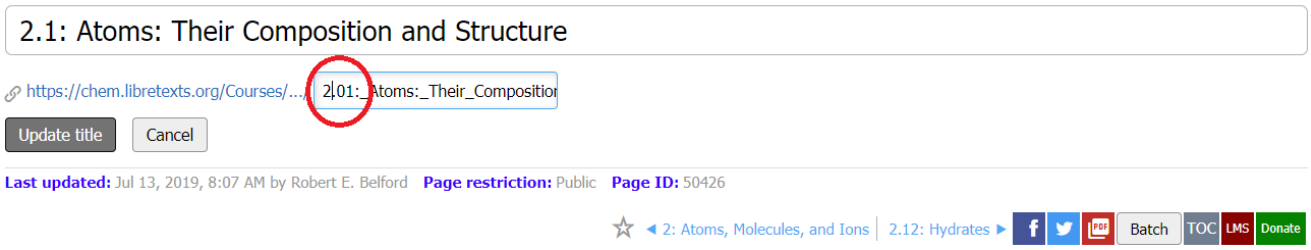


Figure 5

Click on update title and the uncoupling is complete. This change does not alter the title, but only the URL. But, the order is now adjusted in the presentation. If we go back to the chapter 2 view (Figure 6) we can see that Section 2.1 is now before Section 2.12 as desired.

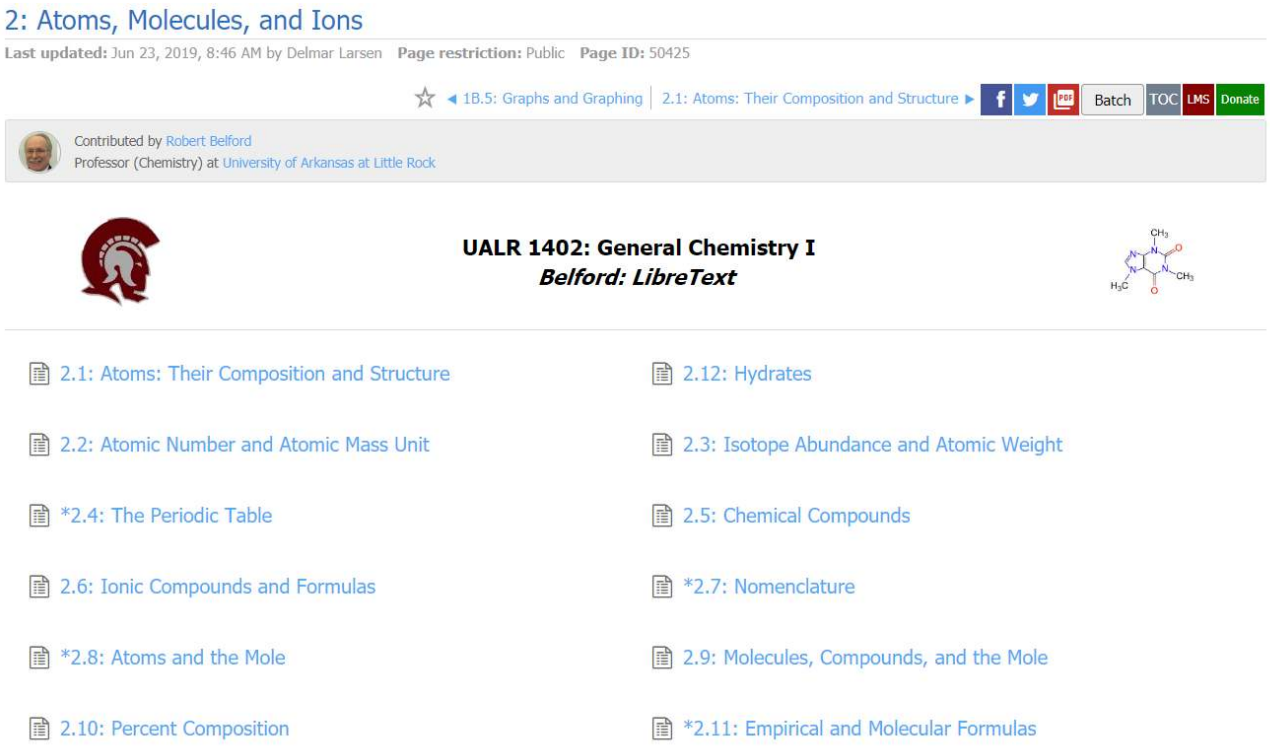


Figure 6

This process needs to be repeated for all pages with single-digit prefixes numbers. This procedure clearly only needs to be done for chapters with more than 9 sections. The LibreTexts development team is working on a more automated approach to address this and it may be simpler to do using the remixer.

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4.5: Adding and Editing Equations

Our adding equations video tutorial on YouTube:



youtu.be/74b5lf-4Y4A

Equations in LibreTexts are handled by the MathJax add-on (based on LaTeX). This page contains guidelines and references on how to use this system. It is fairly straight-forward for anyone who has ever worked with code (markup).

Inline vs. Displaymode Equations

To add an equation, authors have two choices: either (1) **inline** or (2) **display**. The difference is demonstrated here:

An inline equation looks like this, $E = mc^2$, and is meant to be read with the paragraph. An equation that is presented in display mode looks like this

$$E = mc^2 \tag{4.5.1}$$

with the equation taking up the entire line. Note that the displaystyle equation is automatically numbered.

To invoke an inline equation add \(and \) around the LaTeX code (discussed below). To invoke the display mode add \[and \] around the LaTeX code. The code can be somewhat complicated and must be formulated properly or the MathJax add-on will not render the equation (or will do so improperly). Examples of MathJax code, including some useful templates, can be found at the bottom of this page.

Mathpix: The Tool you Can't Live Without

MathJax is a little overwhelming at first but thankfully there is a tool that makes it super easy called MathPix Snip.

- Download the tool from https://mathpix.com/ and install it on your computer
- When you need to transfer an equation press ctrl+alt+m and select the equation that you want to copy.
- Use the first line that doesn't have any environment coding and add the \(or \[for inline or display mode environment manually.
- If the snipper got a few details wrong you can edit the code and check that it renders before copying it over
- If it is a complicated equation zoom in on it using your browser before using the tool. If it still doesn't work consider snipping the equation in several parts.

Intrapage Numbering and Referencing of Equations

The MathJax system is ideal for referencing equations on a page. Equations in displaymode (i.e., used with

$$(4.5.2)$$

delimiters) are automatically numbered, inline equations (using delimiters) are not. If you want to reference a displayed equation you give it a label by writing \label{name} after the equation but before \]. For example, the following code

```
\[ E =mc^2 \label{Einstein} \] See equation \ref{Einstein}
```

renders as

$$E = mc^2 \tag{4.5.3}$$

See equation 4.5.3

If you do not want a display equation to be numbered you can use \nonumber after the equation (and drop the label text since that is unneeded.

```
\[ E =mc^2 \nonumber\]
```

renders as

$$E = mc^2$$

Interpage Numbering and Referencing of Equations

Interpage referencing is a bit more complicated. The best option currently involves HTML rather than MathJax.

- Source page: This is the page you want to link to. Once you edit the page, place your cursor at a place you wish to create a link. Then select Elements on the menu and choose the Anchor option. You can use it like you would \label in LaTeX/MathJax. It adds a little flag that is visible when in Edit mode.
- Reference page: This is the page on which you wish to place a link to an anchor on another page. Go to this page and open the edit view. Highlight text you want to be a link. Go to Elements menu again and click Link (there is also a button on the blue WYSIWYG editor bar for this). Select the source page and at the bottom entry titled "Jump to anchor or section", you will see the text you used for the label on the source page. Save this link and save the page.

If the equation shows up just under the floating blue bar, you can move the anchor to the paragraph before to make it display as desired (small issues until we get it fixed).

When editing math pages

- Be sure to use the escape character \ in front of all trigonometric functions ($\sin x, \cos x, \tan x$,) natural logarithms ($\ln x$), etc. Then leave a space between the function and its argument unless there is a parentheses there. For example, \sin x or \sin(x) (rendering as $\sin x$ and $\sin(x)$, respectively). If you don't do this, the results may look like this: $sinx, cosx$, \sinx, lnx, \lnx
- Use the escape character \ in front of "lim" for limits.
- If limits, integrals or sigma notation (sums) are to be used as part of inline mathematics, be sure to add \displaystyle as the first commands of these inline math expressions. Here is what a limit should look like when rendered correctly: $\lim\limits_{x\to 0} \dfrac{\sin x}{x}$, and incorrectly: $lim_{x\to 0} \frac{\sin x}{x}$.
- Display mode mathematics will never need \displaystyle.
- Do not use \displaystyle unless it is helpful for making one of the above mathematical notations render nicely.
- To obtain larger fractions in an inline setting like $\dfrac{2x}{x^2+1}$ instead of small ones like $\frac{2x}{x^2+1}$, use \dfrac instead of using \displaystyle with \frac which would have the same effect, but is overkill unless the \displaystyle is needed for another reason like those listed above.
- When using display mode mathematics between \[and \], consider whether the equation is an important result that may be referred to later in the text or not. By default display mode mathematics lines will be aut\nonumbered. If the equation is not a main result, it should typically not be numbered, so you will need to insert a \n\nonumber at the end of it but within the expression.
- Do not use any extra commands, like \mathrm, in front of every instance of math in a page to try to get text to look a certain way. There should be a better way to get the desired effect.
- When editing integrals, please use a spacing element before the differential. For example, \displaystyle \int x^2 \, dx.

Other examples to learn MathJax/Latex from

- en.wikibooks.org/wiki/LaTeX/Mathematics
- This link www.codecogs.com/latex/eqneditor.php(external link) is an online WYSIWYG LaTeX editor that creates math expressions using templates. The LaTeX is automatically written and a preview is displayed. Just copy the code and paste it. Be sure to enclose the LaTeX in dollar signs ($).
- en.wikibooks.org/wiki/LaTeX/Mathematics
- https://www.cs.odu.edu/~zeil/cs390/l...math/demo.html
- http://www.artofproblemsolving.com/W...LaTeX:Commands
- http://www.onemathematicalcat.org/Ma.../TeXSyntax.htm
- https://en.wikibooks.org/wiki/LaTeX/Advanced_Mathematics

DO NOT USE EXTERNAL SITES LIKE www.codecogs.com/latex TO RENDER THE EQUATION FOR YOU VIA PROVIDING AN IMAGE FILE.

Table 1: Subscripts, superscripts, integrals

Feature	Syntax	How it looks rendered
Superscript	`a^2`	a^2
Subscript	`a_2`	a_2
Grouping	`a^{2+2}`	a^{2+2}
	`a_{i,j}`	$a_{i,j}$
Combining sub & super	`x_2^3`	x_2^3
Preceding and/or Additional sub & super	`\sideset{_1^2}{_3^4}\prod_a^b`	$\sideset{_1^2}{_3^4}\prod_a^b$
	`{}_1^2\!\Omega_3^4`	${}_1^2\!\Omega_3^4$
Stacking	`\overset{\alpha}{\omega}`	$\overset{\alpha}{\omega}$
	`\underset{\alpha}{\omega}`	$\underset{\alpha}{\omega}$
	`\overset{\alpha}{\underset{\gamma}{\omega}}`	$\overset{\alpha}{\underset{\gamma}{\omega}}$
	`\stackrel{\alpha}{\omega}`	$\stackrel{\alpha}{\omega}$
Derivative (forced PNG)	`x', y, f', f\!`	
Derivative (f in italics may overlap primes in HTML)	`x', y, f', f`	x', y'', f', f''
Derivative (wrong in HTML)	`x^\prime, y^{\prime\prime}`	x', y''
Derivative (wrong in PNG)	`x\prime, y\prime\prime`	$x\prime, y\prime\prime$
Derivative dots	`\dot{x}, \ddot{x}`	$\dot{x}, \ddot{x}$
Underlines, overlines, vectors	`\hat a \ \bar b \ \vec c`	$\hat a \ \bar b \ \vec c$
	`\overrightarrow{a b} \ \overleftarrow{c d} \ \widehat{d e f}`	$\overrightarrow{a b} \ \overleftarrow{c d} \ \widehat{d e f}$
	`\overline{g h i} \ \underline{j k l}`	$\overline{g h i} \ \underline{j k l}$
Arrows	`A \xleftarrow{n+\mu-1} B \xrightarrow[T]{n\pm i-1} C`	$A \xleftarrow{n+\mu-1} B \xrightarrow[T]{n\pm i-1} C$
Overbraces	`\overbrace{ 1+2+\cdots+100 }^{5050}`	$\overbrace{1+2+\cdots+100}^{5050}$
Underbraces	`\underbrace{ a+b+\cdots+z }_{26}`	$\underbrace{a+b+\cdots+z}_{26}$
Sum	`\sum_{k=1}^N k^2`	$\sum_{k=1}^N k^2$
Sum (force `\displaystyle` for inline use)	`\displaystyle \sum_{k=1}^N k^2`	$\displaystyle \sum_{k=1}^N k^2$
Product	`\prod_{i=1}^N x_i`	$\prod_{i=1}^N x_i$
Product (force `\displaystyle` for inline use)	`\displaystyle \prod_{i=1}^N x_i`	$\displaystyle \prod_{i=1}^N x_i$
Coproduct	`\coprod_{i=1}^N x_i`	$\coprod_{i=1}^N x_i$
Coproduct (force `\displaystyle` for inline use)	`\displaystyle \coprod_{i=1}^N x_i`	$\displaystyle \coprod_{i=1}^N x_i$
Limit	`\lim_{n \to \infty}x_n`	$\lim_{n \to \infty} x_n$

Limit (force `\displaystyle` for inline use)	`\displaystyle \lim_{n \to \infty}x_n`	$\displaystyle \lim_{n \to \infty}x_n$
Integral	`\int\limits_{-N}^{N} e^x\, dx`	$\int\limits_{-N}^{N} e^x\, dx$
Integral (force `\displaystyle` for inline use)	`\displaytstyle \int\limits_{-N}^{N} e^x\, dx`	$\displaystyle \int\limits_{-N}^{N} e^x\, dx$
Double integral	`\iint\limits_{D} \, dx\,dy`	$\iint\limits_{D} \, dx\,dy$
Triple integral	`\iiint\limits_{E} \, dx\,dy\,dz`	$\iiint\limits_{E} \, dx\,dy\,dz$
Quadruple integral	`\iiiint\limits_{F} \, dx\,dy\,dz\,dt`	$\iiiint\limits_{F} \, dx\,dy\,dz\,dt$
Path integral	`\oint\limits_{C} x^3\, dx + 4y^2\, dy`	$\oint\limits_{C} x^3\, dx + 4y^2\, dy$
Intersections	`\bigcap_1^{n} p`	$\bigcap_1^{n} p$
Unions	`\bigcup_1^{k} p`	$\bigcup_1^{k} p$
Cancelling factors	`\dfrac{\cancel{(x-3)}(x+5)} {\cancel{(x-3)}`	$\dfrac{\cancel{(x-3)}(x+5)}{\cancel{(x-3)}}$

Table 2: Fractions, matrices, multilines

Feature	Syntax	How it looks rendered
Fractions	`\frac{2}{4}=0.5`	$\frac{2}{4}=0.5$
Small Fractions	`\tfrac{2}{4} = 0.5`	$\tfrac{2}{4} = 0.5$
Large (normal) Fractions	`\dfrac{2}{4} = 0.5`	$\dfrac{2}{4} = 0.5$
Large (nested) Fractions	`\cfrac{2}{c + \cfrac{2}{d + \cfrac{2}{4}}} = a`	$\cfrac{2}{c+\cfrac{2}{d+\cfrac{2}{4}}} = a$
Binomial coefficients	`\binom{n}{k}`	$\binom{n}{k}$
Small Binomial coefficients	`\tbinom{n}{k}`	$\tbinom{n}{k}$
Large (normal) Binomial coefficients	`\dbinom{n}{k}`	$\dbinom{n}{k}$
Matrices	`\begin{matrix} x & y \\ z & v \end{matrix}`	$\begin{matrix} x & y \\ z & v \end{matrix}$
	`\begin{vmatrix} x & y \\ z & v \end{vmatrix}`	$\begin{vmatrix} x & y \\ z & v \end{vmatrix}$

	`\begin{Vmatrix}` `  x & y \\` `  z & v` `\end{Vmatrix}`	$\begin{Vmatrix} x & y \\ z & v \end{Vmatrix}$
	`\begin{bmatrix}` `  0      & \cdots & 0      \\` `  \vdots & \ddots & \vdots \\` `  0      & \cdots & 0` `\end{bmatrix}`	$\begin{bmatrix} 0 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 0 \end{bmatrix}$
	`\begin{Bmatrix}` `  x & y \\` `  z & v` `\end{Bmatrix}`	$\begin{Bmatrix} x & y \\ z & v \end{Bmatrix}$
	`\begin{pmatrix}` `  x & y \\` `  z & v` `\end{pmatrix}`	$\begin{pmatrix} x & y \\ z & v \end{pmatrix}$
	`\bigl( \begin{smallmatrix}` `  a&b\\ c&d` `\end{smallmatrix} \bigr)`	$\bigl(\begin{smallmatrix} a&b\\ c&d \end{smallmatrix} \bigr)$
Case distinctions	`f(n) =` `\begin{cases}` `  n/2,  & \mbox{if }n\mbox{ i` `  3n+1, & \mbox{if }n\mbox{ i` `\end{cases}`	$f(n) = \begin{cases} n/2, & \text{if } n \text{ is even} \\ 3n+1, & \text{if } n \text{ is odd} \end{cases}$
Multiline equations (use * for n\nonumber) [4pt] or [5pt], etc., are used to space between lines	`\begin{align*}` ` f(x) & = (a+b)^2 \\[4pt]` `  & = a^2+2ab+b^2` `\end{align*}`	$\begin{aligned} f(x) &= (a+b)^2 \\ &= a^2+2ab+b^2 \end{aligned}$
Multiline equations with explanations	`\begin{align*}` ` f(x) &= (a+b)^2 & &` ` \text{Original binomial squa` ` \\[5pt]` ` &= a^2+2ab+b^2 & &\text{Expa` `\end{align*}`	$\begin{aligned} f(x) &= (a+b)^2 && \text{Original binomial s} \\ &= a^2+2ab+b^2 && \text{Expand.} \end{aligned}$

Multiline equations (must define number of colums used ({lcr}) (should not be used unless needed)	`\begin{array}{lcl}` `  z  & = & a \\` `  f(x,y,z) & = & x + y + z` `\end{array}`	$\begin{array}{lcl} z & = & a \\ f(x,y,z) & = & x + y + z \end{array}$
Multiline equations (more)	`\begin{array}{lcr}` `  z  & = & a \\` `  f(x,y,z) & = & x + y + z` `\end{array}`	$\begin{array}{lcr} z & = & a \\ f(x,y,z) & = & x + y + z \end{array}$
Breaking up a long expression so that it wraps when necessary	`<math>f(x) \,\!</math>` `<math>= \sum_{n=0}^\infty a_n` `<math>= a_0+a_1x+a_2x^2+\cdot`	$f(x) = \sum_{n=0}^{\infty} a_n x^n = a_0 + a_1 x + a_2 x^2 + \cdots$
Simultaneous equations	`\begin{cases}` `  3x + 5y +  z \\` `  7x - 2y + 4z \\` `  -6x + 3y + 2z` `\end{cases}`	$\begin{cases} 3x + 5y + z \\ 7x - 2y + 4z \\ -6x + 3y + 2z \end{cases}$
Long Division	`\require{enclose}` `\begin{array}{r}x+\phantom{0}` `x+5\enclose{longdiv}{x^2+\pha` `\underline{{\color{red}-}x^2+` `4x+20\hspace{.5em}\\[-3pt]` `\underline{{\color{red}-}4x+(` `0\hspace{.33em}\end{array}`	$\begin{array}{r} x+4 \\ x+5\enclose{longdiv}{x^2+9x+20} \\ \underline{-x^2+(-5x)} \\ 4x+20 \\ \underline{-4x+(-20)} \\ 0 \end{array}$
Synthetic Division	`{\begin{array}{c}-2\\ \\ \\` `\end{array}}` `{\begin{align*}&\\[0pt]` `&{\begin{array}{r|}\\[0pt]` `  \\[0pt] \end{array}}\\[1pt]` `  & \\[2pt]& \end{align*}}\!\!` `{\begin{array}{rrrr}` `4 & 10 & -6 & -20\\` `& -8 & -4 & 20 \\` `\hline 4 & 2& -10 & 0` `\end{array}}`	$\begin{array}{r\|rrrr} -2 & 4 & 10 & -6 & -20 \\ & & -8 & -4 & 20 \\ \hline & 4 & 2 & -10 & 0 \end{array}$

Chemistry Package

The Libretexts libraries have also installed the mhchem, a tool for writing beautiful chemical equations easily. The syntax for this powerful add-on can be found here: https://mhchem.github.io/MathJax-mhchem/

Contributors and Attributions

- SklogWiki

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4.5.1: Equation Formatting Conventions

For each of the following exercises, fix the LaTeX and formatting as described in the Tutorial.

1. Equation numbering

Note that this equation is not automatically numbered since it is inline.

$f(x) = x^2 + y^2$

Remove the equation number from this equation while keeping it in display mode.

$$f(x) = x^2 + y^2 \tag{4.5.1.1}$$

Remove the aut\nonumbering on this aligned equation by adding asterisks.

$$f'(x) = 3 \cdot (x^2+1)^2 \cdot 2x \tag{4.5.1.2}$$

$$= 6x(x^2+1)^2 \tag{4.5.1.3}$$

2. Aligning equal signs over multiple lines using begin{align*} and end{align*}

Format this chain equality using begin(align*} and end{align*} commands. Also fix other issues with the trig functions and powers.

Example 1:

$$\begin{aligned}
\frac{1}{12}(cos(3x) - 9cosx) &= \frac{1}{12}(cos(x+2x) - 9cosx) \\
&= \frac{1}{12}(\cos(x)cos(2x) - \sin(x)\sin(2x) - 9cosx) \\
&= \frac{1}{12}(\cos x(2cos^2 x - 1) - \sin x(2sinxcosx) - 9cosx) \\
&= \frac{1}{12}(2\cos_3 x - \cos x - 2\cos x(1 - cos^2 x) - 9cosx) \\
&= \frac{1}{12}(4\cos_3 x - 12\cos x) \\
&= \frac{1}{3}\cos_3 x - \cos x.
\end{aligned}$$

Format this chain equality with explanations using begin(align*} and end{align*} commands.

Example 2:

Thus,

$$\int \frac{\sqrt{4-x^2}}{x}dx = \int \frac{\sqrt{4-(2\sin\theta)^2}}{2\sin\theta} 2\cos\theta\, d\theta \text{ Substitute } x = 2\sin\theta \text{ and } = 2\cos\theta\, d\theta.$$

$$= \int \frac{2\cos^2\theta}{\sin\theta}\, d\theta \text{ Substitute } \cos^2\theta = 1 - \sin^2\theta \text{ and simplify.}$$

$$= \int \frac{2(1-\sin^2\theta)}{\sin\theta}\, d\theta \text{ Substitute } \sin 2\theta = 1 - \cos^2\theta\ .$$

$$= \int (2\csc\theta - 2\sin\theta)\, d\theta \text{ Separate the numerator, simplify, and use } \csc\theta = \frac{1}{\sin\theta}\ .$$

$$= 2ln|\csc\theta - \cot\theta| + 2\cos\theta + C \text{ Evaluate the integral.}$$

$$= 2ln\left|\frac{2}{x} - \frac{\sqrt{4-x^2}}{x}\right| + \sqrt{4-x^2} + C. \text{ Use the reference triangle to rewrite the expression in terms of } x \text{ and simplify.}$$

3. Formatting functions correctly: sin x, cos x, ln x, arctan x, etc.

If you have not already done so, fix the functions in part 2 above.

4. Proper use of displaystyle

First consider #2 above, to determine whether \displaystyle is needed there.

Add where it is needed in the examples below and remove it where it is not. Also consider spacing of the differential in integrals.

$$(\int_0^5 (5+2t)\,dt.$$

$(\int_0^2 (x^2+1)dx$

$\sum_{n=1}^{\infty} a_n$

$\lim_{x\to 3} f(x) = 9$

Note that $\lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\,\Delta x_i = \int_a^b f(x)\,dx$.

5. Using \left and \right, \big, \Big, \bigg, and \Bigg to size grouping symbols appropriately.

Fix the alignment in the following problem, and also address the size of the grouping symbols and the evaluation bar.

$$\int_0^5 10+\cos(\frac{\pi}{2}t)\,dt = (10t+\frac{2}{\pi}\sin(\frac{\pi}{2}t))|_0^5$$

$$= (50+\frac{2}{\pi}) - (0-\frac{2}{\pi}\sin 0) \approx 50.6.$$

This page titled 4.5.1: Equation Formatting Conventions is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

4.6: Adding Alt-Texts

Adding alt-texts descriptors to images on the LibreTexts is critical to satisfy Search Engine Optimization and also accessibility to screen-readers for students with limited visual skills. For information regarding alt-texts check out these pages.

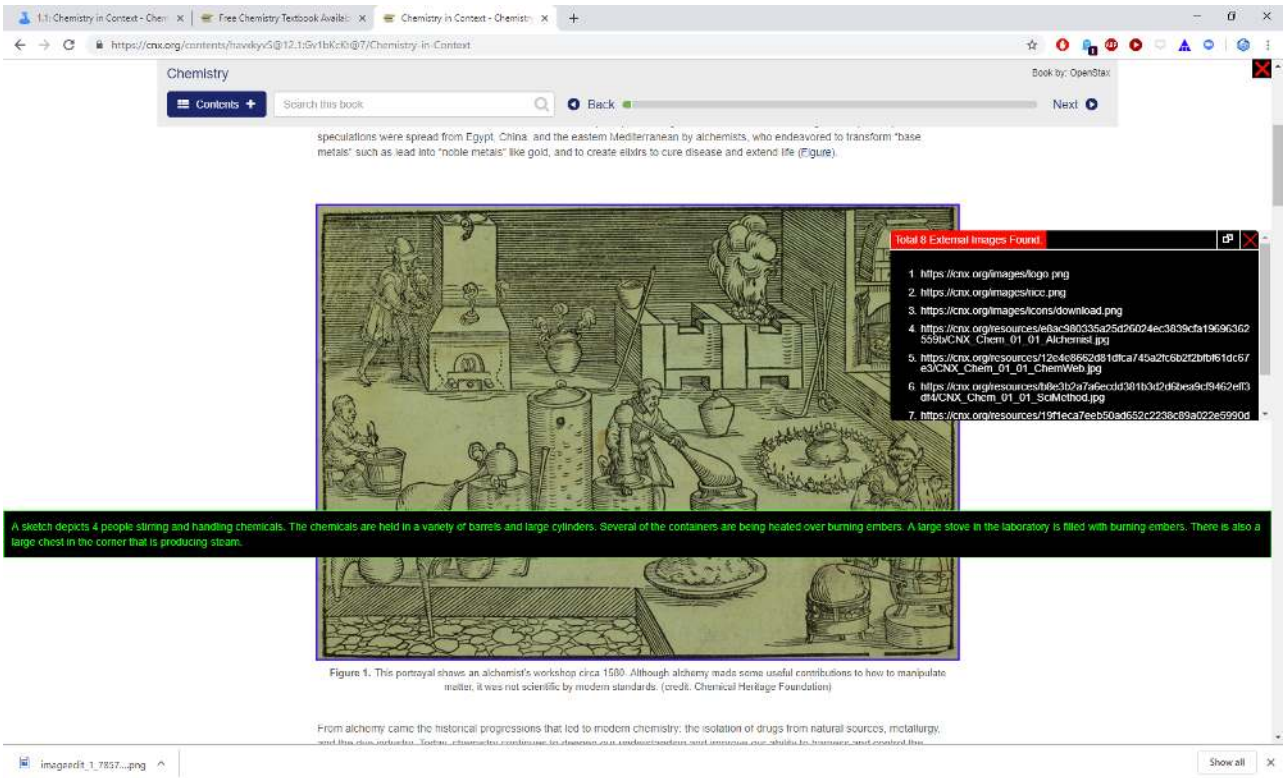
- https://moz.com/learn/seo/alt-text
- https://blog.hubspot.com/marketing/image-alt-text

There are two approaches to adding alt-text to the images and tables of the LibreTexts depending if the text needs to be construction or already exists.

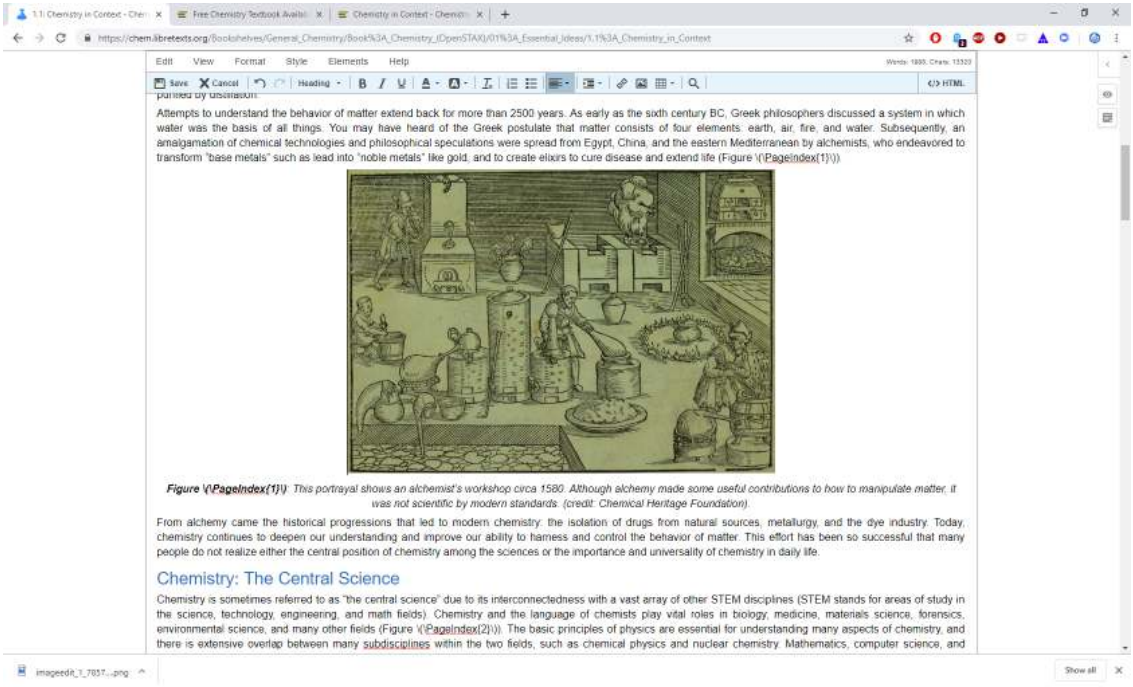
Approach 1: Adding Existing alt-text text to images

This is the easiest approach, which is largely a cut-paste approach. While this approach works best on a two-screen system, it can work fine enough for multiple tags on a single browser/screen. There are three steps: Prepare, Copy and Paste:

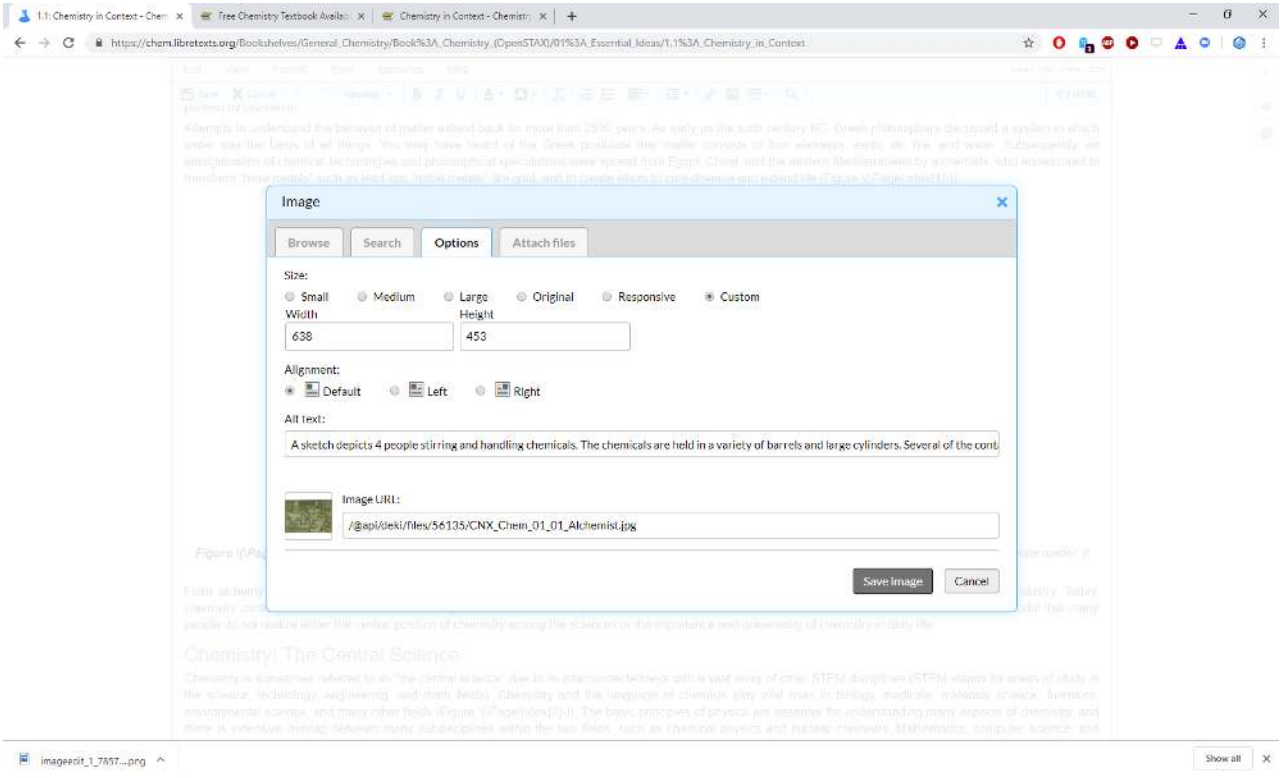
- **Prepare:**
  - The LibreTexts page and its source page needs to be open in independent browsers (or tabs). For example:
    - https://chem.libretexts.org/Bookshelves/General_Chemistry/Book%3A_Chemistry_(OpenSTAX)/01%3A_Essential_Ideas/1.1%3A_Chemistry_in_Context
    - https://cnx.org/contents/havxkyvS@12.1:Gv1bKcKt@7/Chemistry-in-Context (source)
  - **Copy**:
    - It is best to install an add-on to the web browser to easily view and copy alt-texts on a web page. There are many out there. The one that the LibreTexts team recommends is the alt-text-tester: https://chrome.google.com/webstore/detail/alt-text-tester/koldhcllpbdfcdpfpbldbicbgddglodk.
    - Then each figure needs to be stepped through. For the the first image of the source page, if you hover and double click the alt-text will go into the computer clipboard



- **Paste**: Then go to the corresponding LibreTexts page and "edit" the page and double-click on the corresponding image.



- A popup window will give you the option to add alt-text (by pasting) into the page.



- Paste the text (like above) and then press "Save Image".

Cycle through all the images on the page and then save the entire page "save" on the editor tool bar (far left).

Approach 2: Writing and Adding alt-text text to images

This approach is similar, but require crafting a proper alt-text before pasting into the image properties box. The protocols for formulating "good" alt-texts will be forthcoming.

Best Practices for Alt-Texts

- Keep alt text limited to 144 characters.
- Create caption for content over 144 characters.
  - Blank alt tag (decorative) should be used for images that carry no useful information.
- Do not create alt tags for images discussed on page, mark as “decorative”.

Some other issues to be aware of:

- Tables of information should not be posted as images and needs to be recreated on the page.

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4.7: Front and Back Matter

The front matter and back matter are automatically updated on a weekly basis.

- The back matter does not have content in it yet for most books, but that is where authors can add glossaries and indexes. The latter are dynamically constructed for textbooks. To add terms to the index, add metatages for each page on the page settings. To build a rollover glossary edit the glossary page and add word/phrases and their definition to the table.
- The front matter always has three pages: titlepage, infopage, and table of contents. Other pages can be added like "preface", "about the author", "about the book", "acknowledgments" etc. Authors have flexibility in this matter.

4.8: Compiling, Batching, and the Download Center

Texts are available for exporting via two processes on the LibreTexts platform: Compiling and Batching.

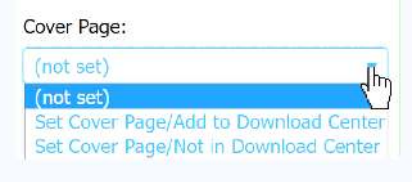
Compiling

While most users access the content on the LibreTexts directly via our web interface, other mechanisms for dissemination exist as discussed in Chapter 8 of the Construction Guide.

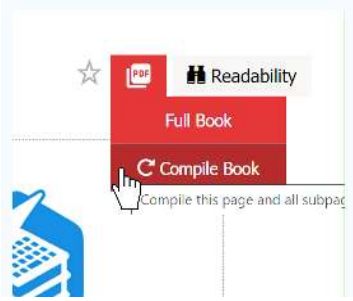
> Since compiling is a both a time consuming and CPU consuming activity, to reduce server load, only specific users have access to force compiling in real time. Contact the development team (info@libretexts.org) to request this permission.

Initial step: "Compile"

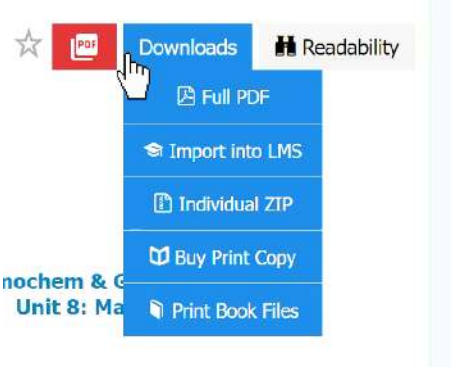
To compile a book access must be set to public using the restrict access selection in the Options menu drop down and the Cover Page menu in the Page Settings must be set. One can choose to make the book downloadable or not.



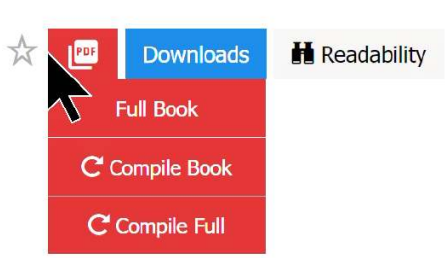
Using the pdf button the book can now be compiled



Once the text has been compiled, then a new blue "Download" buttons appear on the top right of the book.



If changes are made in a compiled book it must be recompiled so that the changes are reflected in the printed versions. A simple compile is faster but if the structure of the LibreTexts has been changed (pages/chapters added or deleted) a full compile is needed.



Batching

Resources on the LibreTexts platform are considered dynamic and constantly being edited as they are curated or updated. To ensure readers have access to the up to date version of the resources, automatic weekly batch compilation is implemented on each library.

- biology: Saturday @ 0:30
- business: Saturday @12:30
- chemistry: Sunday @ 0:30
- engineering: Sunday @12:30
- espanol: Monday @ 0:30
- geosciences: Monday @12:30
- humanities: Tuesday @ 0:30
- law: Tuesday @12:30 (not implemented yet)
- mathematics: Wednesday @ 0:30
- medicine: Wednesday @12:30
- physics: Thursday @ 0:30
- social sciences: Thursday @12:30
- statistics: Friday @ 0:30
- workforce: Friday @12:30

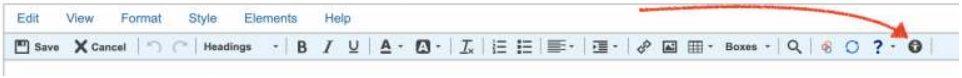
This page titled 4.8: Compiling, Batching, and the Download Center is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

4.9: Accessibility Checker in the Editor

Are you an instructor charged with putting together a textbook? You have resources available to help, especially with the LibreTexts remixer, but you're reminded that it has to be accessible. You may not be familiar with accessibility integrations and inquire "What resources are available within LibreTexts to help with accessibility?"

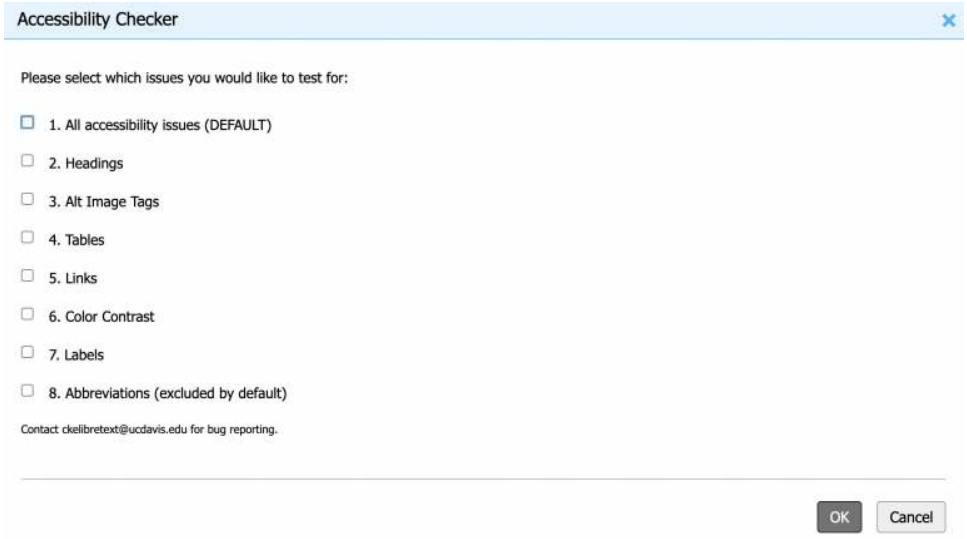
That's where the LibreTexts Accessibility Checker comes to help! The Accessibility Checker is available to authors while editing or remixing textbooks. Select the tool from within the toolbar to fix issues that it finds.

The LibreTexts libraries are housed within the Nice CXOne platform, a CMS, and uses CKEditor 4 to import or create content. Within the editor, we have made a Davinci Vitruvian man available as the Accessibility Checker icon. This feature has both automated and manual fixes which authors interact with. Many of the automation features have manual overrides available so author's have more control of how content is presented.



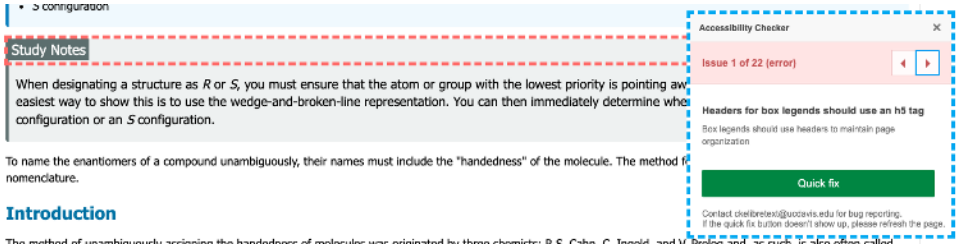
Arrow points to the Davinci Vitruvian man, the Accessibility Checker, the 22nd element in the toolbar.

Once you have activated the Accessibility Checker, a popup appears allowing authors to select checks to perform, or to perform them all, which is the default setting. Abbreviations are excluded from the default at this time

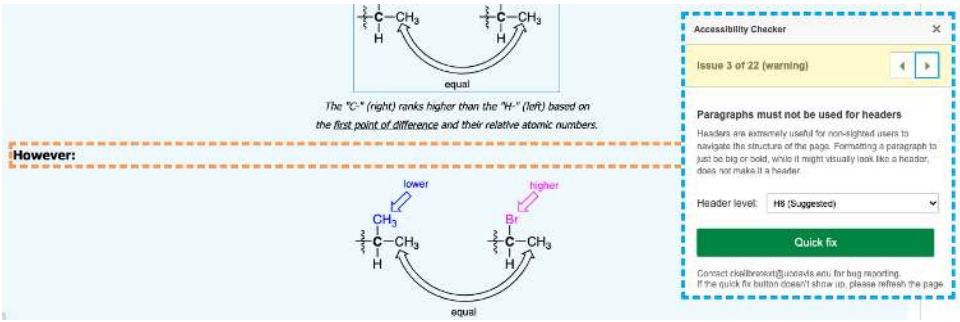


Heading fixes

The tool will locate bold and italic content and suggest heading levels based on the page layout. H1 is always available at the top of the page, so LibreTexts may suggest H2, H3, and H4 to layout their textbooks. Containers (i.e. Learning Objectives, Examples, etc.) start with H5 and have H6, and H7 to help users navigate using headings. We're using ARIA labels to create headings with a level of 7.

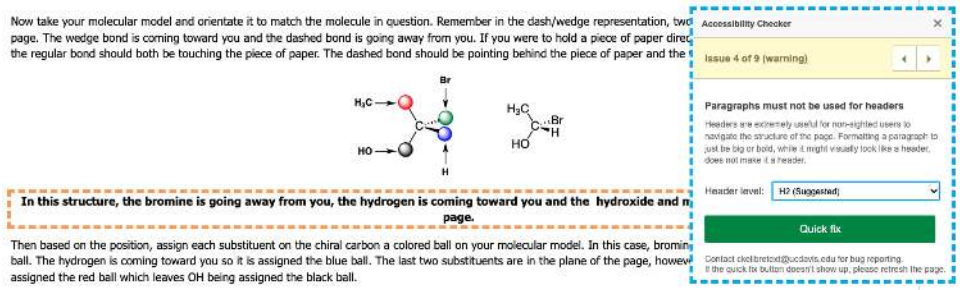


The Accessibility Checker recognizes the wrong heading was used for this Study Notes container and suggests H5 with a quick fix button to fix the issue.



The Accessibility Checker recognizes bold text and suggests a heading of 6 since it's within a container which starts with a heading 5, but has a drop down option to select a different heading if the suggestion isn't correct.

In the following screenshot, the Accessibility Checker identified bold text from a caption and suggested a heading 2. In the "Issue" notification of the checker, which shows the author is on 4 out of 9 issues, there are left and right buttons to allow authors to ignore suggested fixes. Once the "Quick fix" has been submitted, the issue will disappear from the list of issues.



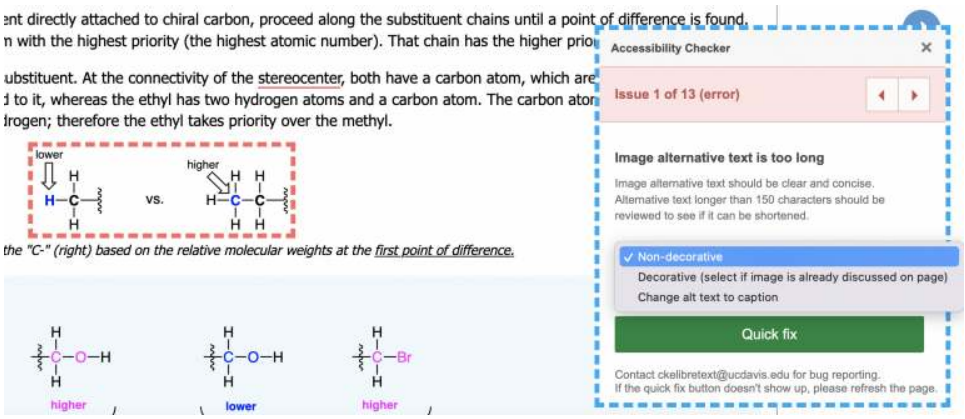
Accessibility Checker has incorrectly located bold content within a caption and is suggesting a heading level of 2 be applied.

Graphics and Alt Tags

For all graphics and images, the Accessibility Checker will require user interaction. The pop-up requesting alternative text for images give users the following options:

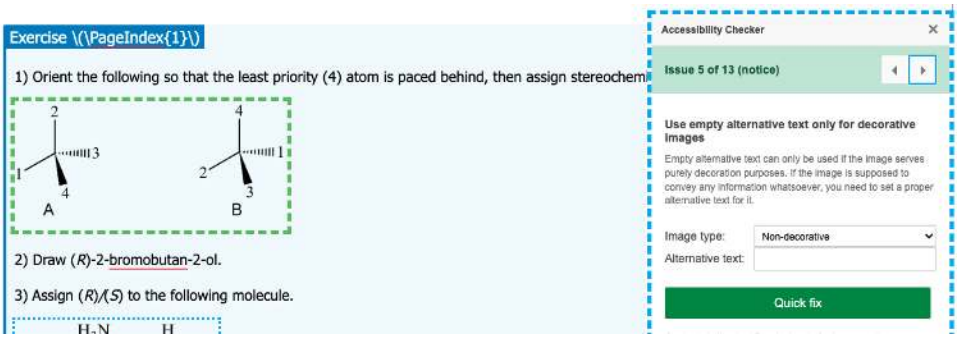
- Non-decorative
- Decorative (select if image is already discussed on page)
- Change alt text to caption

"Non-decorative" will require text within the Alternative text field. "Decorative" will make an empty alt tag to mark it as decorative to screenreaders. "Change alt text to caption" will convert alt text with 150 characters and suggest changing to a caption so learning disabled students benefit. The quick fix button will implement the accessibility fix on the users behalf.



The Accessibility Checker appears as a blue dotted popup with 3 options: Non-Decorative (requires user input), Decorative (select if image is already discussed on page), or Change alt text to caption if it's over 150 words.

The tool will also check if the filename is used as alt text and request the author to submit text to replace the filename with an accessible description.

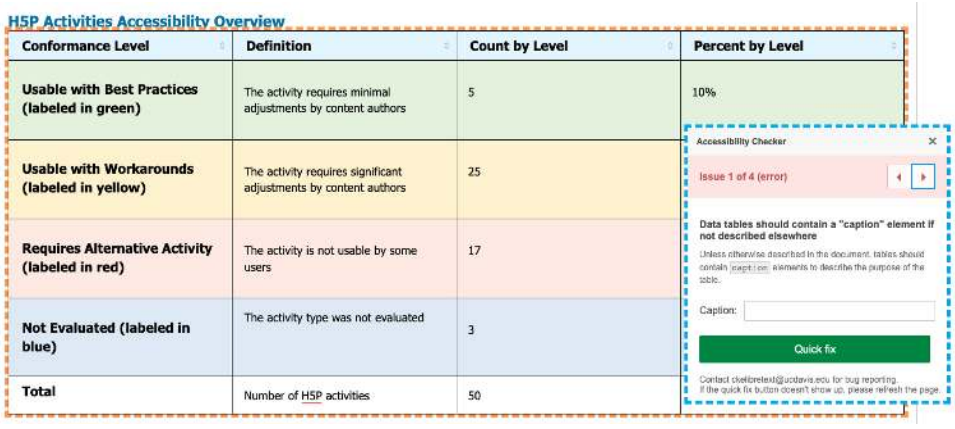


The Accessibility Checker reports an empty alt for an image and requests user input for a quick fix.

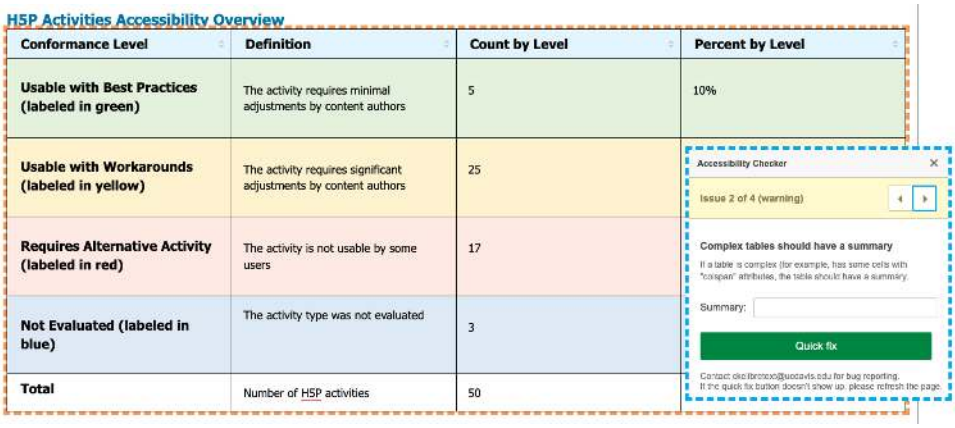
Table fixes

Table accessibility is addressed by the Accessibility Checker and only requires user input for captions and summaries. You don't need to know code for column or row headers, or simplified groups of column or row headers. It's all automagically fixed in the background. Note, there may be complex table(s) which the tool doesn't properly fix.

Complex tables which combine multiple tables into one may need to be separated into multiple tables. While it may be visually appealing to combine the tables, it's impossible to create accessible headings for content after heading columns or rows have been established.



Accessibility Checker has identified a missing caption for the table and requests user input to quick fix the issue.



H5P Activities Accessibility Overview

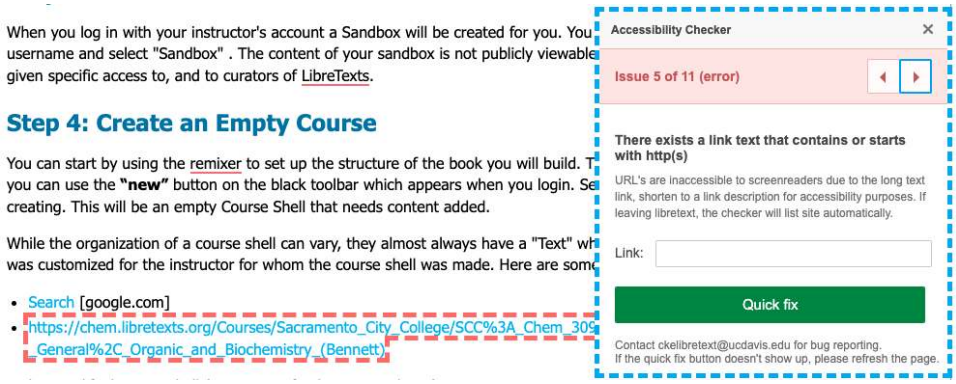
Conformance Level	Definition	Count by Level	Percent by Level
Usable with Best Practices (labeled in green)	The activity requires minimal adjustments by content authors	5	10%
Usable with Workarounds (labeled in yellow)	The activity requires significant adjustments by content authors	25	
Requires Alternative Activity (labeled in red)	The activity is not usable by some users	17	
Not Evaluated (labeled in blue)	The activity type was not evaluated	3	
Total	Number of H5P activities	50	

In the same table, the Accessibility Checker has identified a missing summary which can add instructions for reading complex tables.

Links and URL's

To address the inaccessibility of links and URL's, the team worked on a number of updates. Non-unique links (click here, more, etc.) and URL's can be difficult for screenreaders or magnifiers to interact with.

The tool locates non-unique links or posted URL's and request user interaction to enter in text and replace the URL. Once entered, the tool will then detect if it's a LibreTexts link or if it links to another site. If it's a LibreTexts link, nothing else is done. If it's a link outside of LibreTexts, the tool will wrap the base of the site in brackets and place it after the link.



When you log in with your instructor's account a Sandbox will be created for you. You
username and select "Sandbox" . The content of your sandbox is not publicly viewable
given specific access to, and to curators of LibreTexts.

Step 4: Create an Empty Course

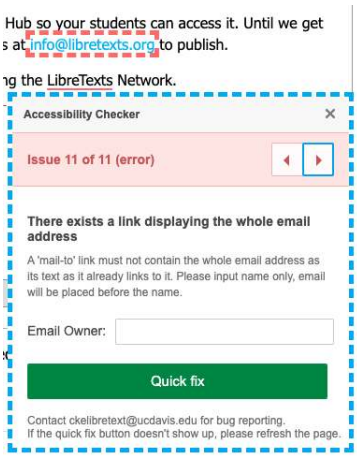
You can start by using the remixer to set up the structure of the book you will build. T
you can use the **"new"** button on the black toolbar which appears when you login. Se
creating. This will be an empty Course Shell that needs content added.

While the organization of a course shell can vary, they almost always have a "Text" wh
was customized for the instructor for whom the course shell was made. Here are som

- Search [google.com]
- https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_Chem_30
_General%2C_Organic_and_Biochemistry_(Bennett)

Accessibility Checker found and fixed a Search link, with Google in brackets, while the tool waits for user input on a highlighted inaccessible link.

The tool will also locate emails within content and request user interaction for typing in the name. The tool will automatically place "eMail:" before the name to make it clear what it's linking to.



Color Contrast

This portion of the tool is still being worked on and is not currently active in the Accessibility Checker. The color contrast will address contrast issues of text content, to ensure all text is accessible and authors aren't use contrasting colors. This is turned off at the moment due to interfering with links.

Labels

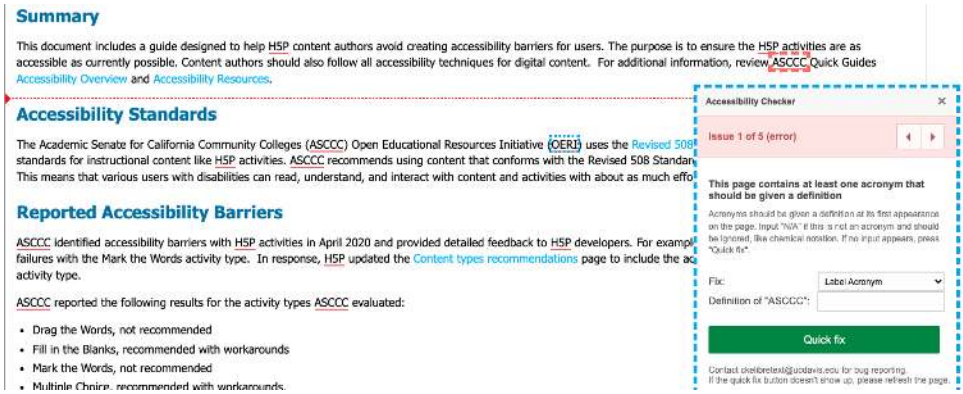
The labels section is also still being worked on and is not currently active in the Accessibility Checker. This section will fix form fields and links to ensure they're properly labeled and interact with assistive technologies. This is turned off at the moment as we work on some reported issues.

Abbreviations and Acronyms

The acronyms section is currently in Beta, and is separate from the rest of the scripts and must be selected from the menu to run.

If you have content in ALL CAPS, such as abbreviations or acronyms, the Accessibility Checker will find unique instances and require user input. Once an element has been located, the following choices will be available:

- Label acronym
- Reformat text to lowercase (recommended for non-acronyms)
- Ignore text



ASCCC is highlighted in red dashes with the Accessibility Checker requiring a definition entered for ASCCC and a Quick fix button.

Choosing “Label acronym” will allow the user to enter a definition to be added which are accessible to mouse and keyboard as a tooltip. We have altered tooltips to be accessible to keyboard users, which allows users to select and enlarge fonts.

This will add a tooltip to all acronyms which users can use their mouse or keyboard to review the acronym definition. Previously this was presented as small, inaccessible, text.

Choosing “Reformat text to lowercase” will alter the text so that it’s no longer ALL CAP, which will force the tool to ignore it. Choosing “Ignore text” will keep the text in ALL CAP and ignore additional attempts to update it.

Because of these labels, a tooltip will be made available to inform users of the meaning. Tooltips were already accessible to screenreaders, but we’ve worked to make it more accessible to mouse and keyboard users! Users can now enlarge and select the text within tooltips!

Every once in a while, form fields the user interacts with will not display in the tool. Please refresh the page to fix this issue. If you run into further issues, please reach out to ckelibretext@ucdavis.edu with the link of the page and error(s) occurring.

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CHAPTER OVERVIEW

5: Interactive Elements

The textbook of the future will be more than traditional textbooks of the past. The LibreText platform is designed to operate with this in mind with multiple interactive technologies available for integration to campus texts.

5.1: Interactive Figures
5.2: Jupyter Notebooks (Executable Programming Code and Figures)
5.2.1: How to Incorporate Data Files in Your Code Blocks- For C++
5.2.2: How to Incorporate Data Files in Your Code Blocks- For Julia
5.2.3: How to Incorporate Data Files in Your Code Blocks- For Octave
5.2.4: How to Incorporate Data Files in Your Code Blocks- For Python
5.2.5: How to Incorporate Data Files in Your Code Blocks- For R
5.2.6: How to Incorporate Data Files in Your Code Blocks- For SageMath
5.2.7: Installing custom packages
5.2.7.1: Documentation of Supported Kernels
5.2.8: Using ipywidgets for Interactivity
5.2.8.1: Enabling and Using Interactive Matplotlib Features
5.2.8.2: Using ipyleaflet for Interactive Mapping
5.2.8.3: Using ipyvolume for 3D plotting
5.2.8.4: Using nglview to view molecular structures and trajectories
5.2.8.5: Using pythreejs to generate and view three-dimensional models
5.2.8.6: Using bqplot to make interactive plots
5.2.8.7: Using IPyCytoscape to visualize graphs
5.3: The Hypothesis Annotation System
5.3.1: Hypothes.is Web Annotations
5.4: Interactive Molecules and Proteins - Direct Embedding
5.5: Interactive Molecule and Protein - Molecule Generator
5.6: Interactive Molecule and Protein - Reference Options
5.7: Adding H5P (formative) Activities
5.8: H5P
5.9: Creating Dynamic Figures with CalcPlot3D
5.10: Adding Geogebra Explorations to LibreTexts Pages
5.11: Adding WeBWorK Problems to LibreTexts

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5.1: Interactive Figures

Interactive figures and simulations can usually be found in the Ancillary Materials section of each Library. They can be added into textbook pages by simply transcluding, in the same way as is outlined in Section 3.1A, by clicking "Content Reuse" with the pull down menu. Below is an example of embedding the Javascript figure from this page:

https://chem.libretexts.org/Ancillar...ction_-_Linked

$\psi_{n_x,n_y}(x,y)$ $|\psi_{n_x,n_y}(x,y)|^2$

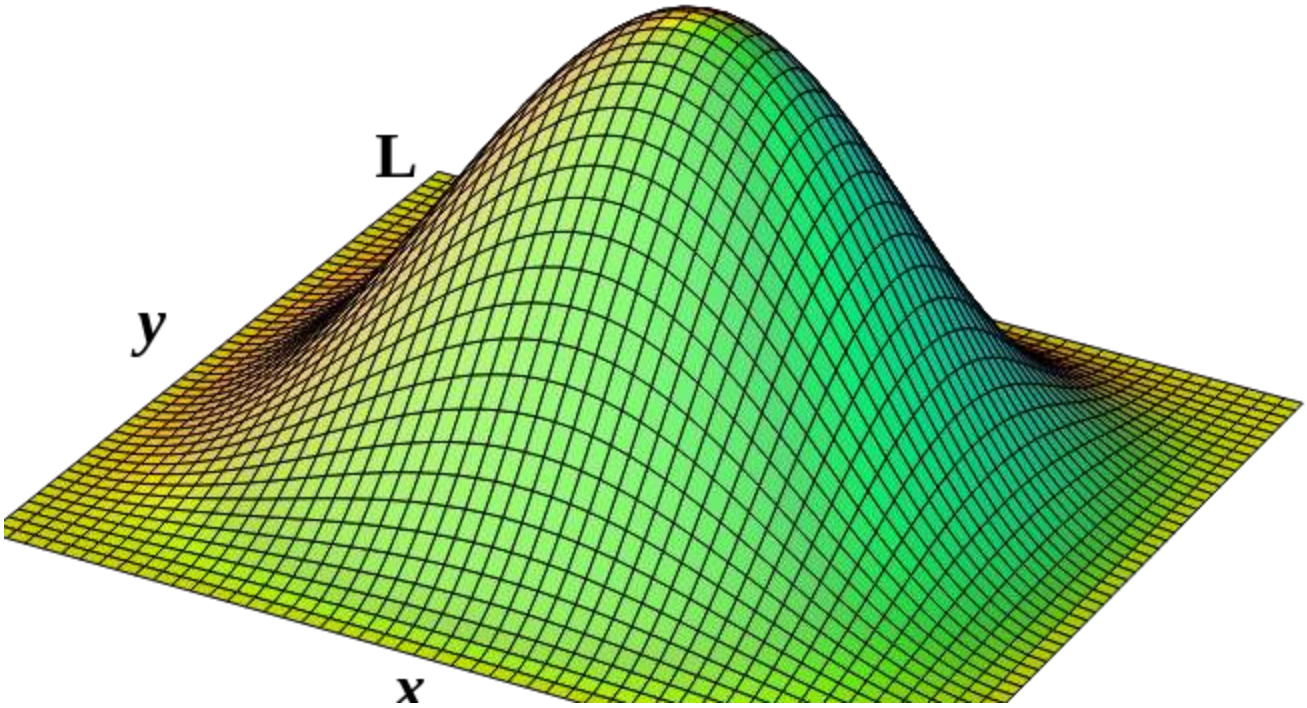


Figure 5.1.1: Interactive CalcPlot3D figure created by Paul Seeburger (Monroe Community College).

There are also other interactive web-based tutorials and simulations that take advantage of the computational features of an online textbook. These include other interactive tools such as virtual laboratories, tutorials, and real-time concept tests.

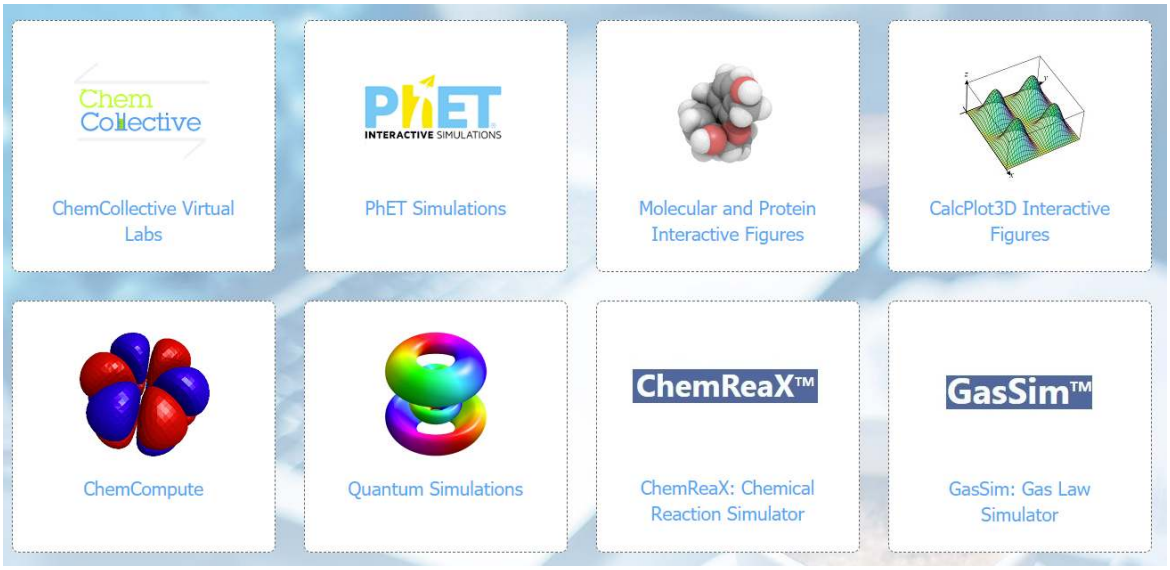
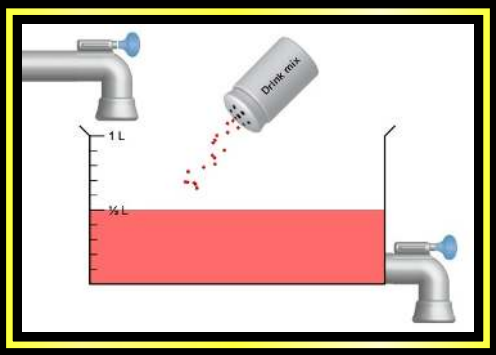


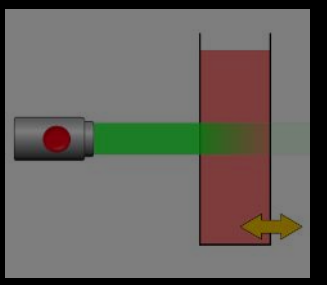
Figure 5.1.2: Interactive Applications that can be embedded into pages including Simulations like PhET.

As another example, here is an embedded Beer's lab PhET simulation.

Beer's Law Lab



Concentration



Beer's Law

Template:HideTOC

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5.2: Jupyter Notebooks (Executable Programming Code and Figures)

CKEditor is a rich text editor which enables the user to write content directly inside web pages or online applications. Through the Binder Plugin, authors of textbooks have the option to include code within their textbook pages to create a more interactive experience for their students. Currently the plugin supports Python 3, Julia, R, Octave, C++, and SageMath. Additionally, all languages with the exception of SageMath support syntax highlighting for an easier scripting experience.

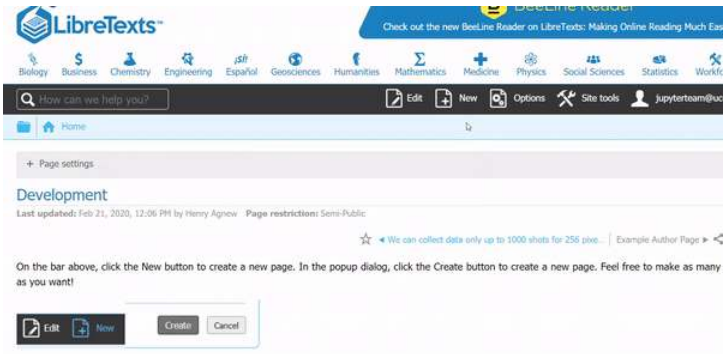
The following video tutorial provides a step-by-step walkthrough of the tutorial.



Step-by-Step Process to use CKEditor Binder Plugin

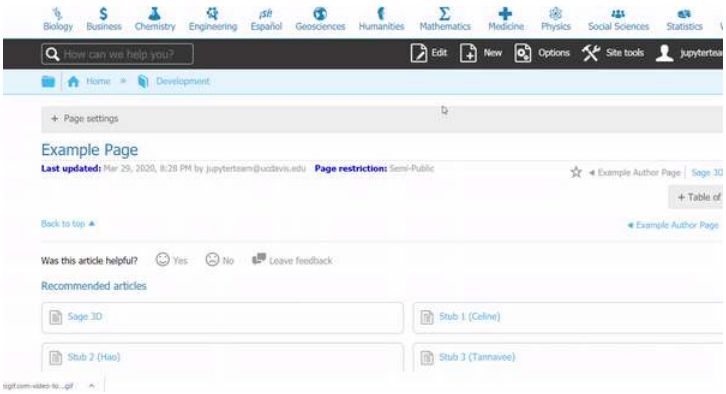
Creating a new page

Authors have the option to add code to a new page.



Editing an existing page

Additionally, authors can also add code to pages that they have already created. To do so, simply click on the "Edit" button.



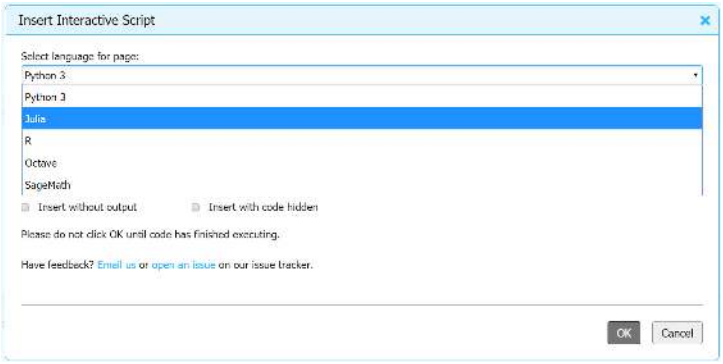
Locating the Plugin and Adding Code

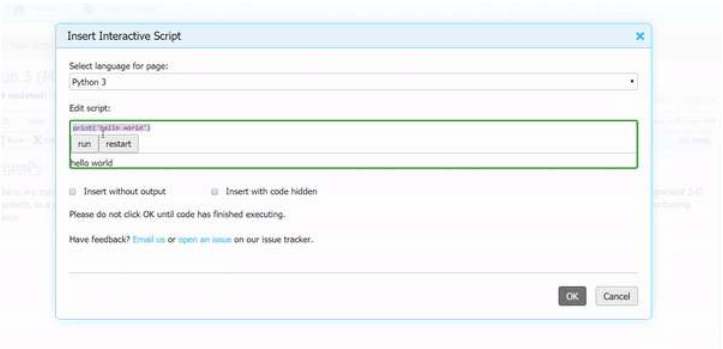
The Binder Logo is the last button on the navigation bar of the text editor. Binder is an external resource that lets you build and run kernels which contain the necessary packages for executing any given code language.



Add Code

To add a block of code, select the language and add your code in the text space. Be sure to press "run" and verify the code output before inserting the code cell into your page. This output will be displayed by default on the webpage even if the cell has not been run by the reader.

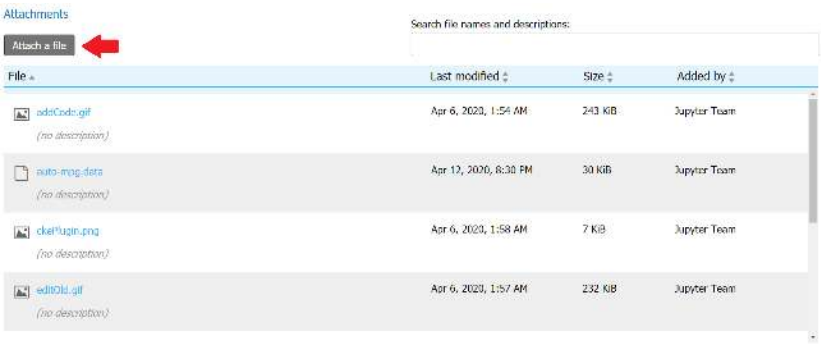




Add Data

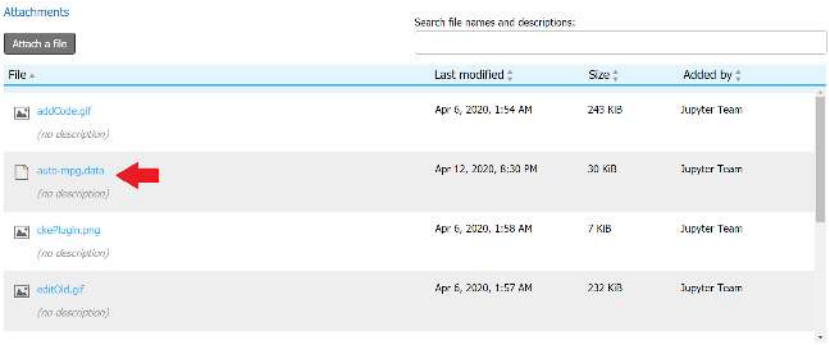
Step 1:

Go to the bottom of the page and attach data file by clicking "Attach a file" link.



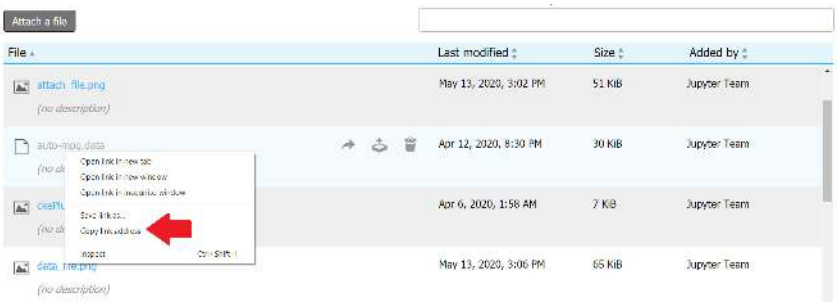
Step 2:

Select the file you want to upload from your local computer, and attach file.



Step 3:

Right click and get link address of file you have uploaded.



Step 4:

To incorporate data into code, click CKEditor Binder Button, select language, and follow the examples below respective to the language you have chosen. when following the tutorial, replace the URL in the example with the one you have.

For Python 3:

This page provides multiples ways to incorporate data into your code blocks, and some possible examples of what you may want to do with your code.

For R:

This tutorial goes over some ways in which to load a data file from a URL for R

For Julia:

View this page to load a file from an URL in Julia

For C++:

Here are some ways for C++.

For SageMath:

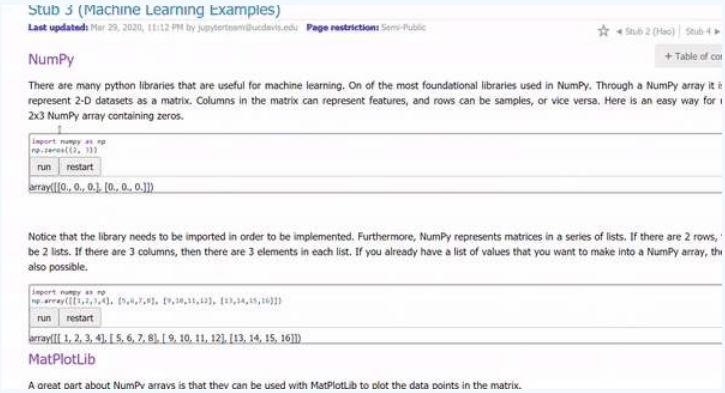
This tutorial goes over some ways in which to load a data file from a URL for SageMath

For Octave:

View this page for Octave.

An Example Page

Remember to press save once edits to the page are done, the following is an example page utilizing the Binder Plugin. As seen, authors can use libraries and packages already available. If a package you would like to use is not available, simply email us, or open an issue on the GitHub repository (information found in the dialogue box of the plugin).



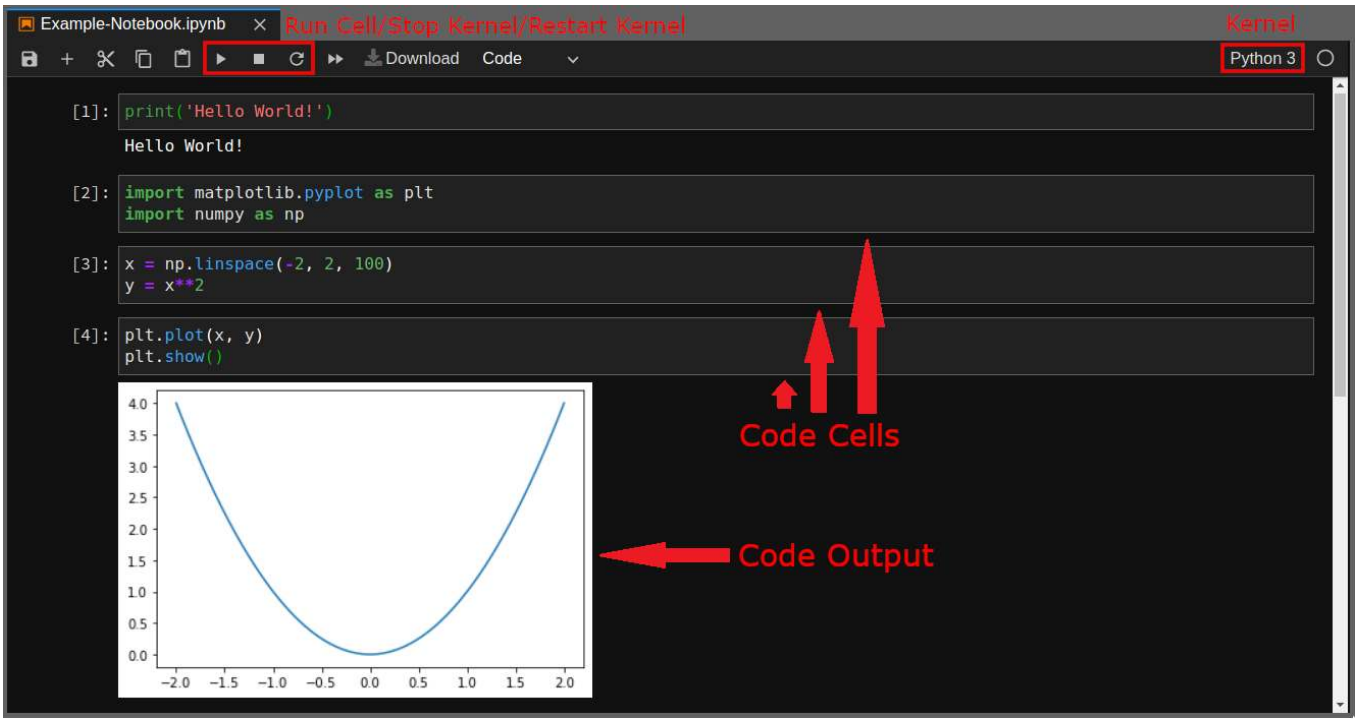
How does CKEditor Binder Plugin Work? (Work in Progress)

A Jupyter Notebook Backend

As mentioned above, CKEditor is the general interface that you use to edit Libretexts pages, while the CKEdtitor Binder plugin allows you to insert code cells and is accessed via the navigation bar in the text editor. The best way to understand how the Binder plugin works is to think of it as turning your Libretexts page into a Jupyter notebook. As explained by Jupyter, these notebooks "are both human-readable documents containing the analysis description and the results [of some project] (figures, tables, etc..) as well as executable documents which can be run to perform data analysis". This means that they can contain both computer code and rich text elements. Put this way it becomes clear as to how a Libretexts page, which may contain richly styled text in addition to code cells, operates very similarly to a Jupyter notebook.

Just like in Jupyter notebooks, the Binder plugin uses kernels to execute code cells. On Libretexts, when you insert an interactive script and select a language the plugin will provide you with the proper kernel to execute that language. Each page may have only one kernel (programming language), and the kernel is activated behind the scenes the first time you "run" a code cell on a page. Once activated, the kernel remains alive and activated across the entire webpage just as it would in a Jupyter notebook. For instance, this is why you can put all of your Python `import` statements into a single code cell at the beginning of your document and later make calls to those modules in seperate cells.

The Jupyter notebook image below should help solidify the analogy even further.



Kernel Quirks and Other Nuances

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5.2.1: How to Incorporate Data Files in Your Code Blocks- For C++

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using wget

The first method that can be used to get a data file in your code block is with wget. Follow the example below and replace the example URL with the one attained in the previous step.



Login with LibreOne to run this code cell interactively.

If you have already signed in, please refresh the page.

Login

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

Remember to press the "Run" button prior to pressing "OK". Printing both the code and output will provide the below result, to avoid this simply check "Insert Code Only" after pressing "Run" in order to achieve the example above.



Login with LibreOne to run this code cell interactively.

If you have already signed in, please refresh the page.

Login

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

```
--2020-05-18 04:16:31--  https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.
Resolving chem.libretexts.org (chem.libretexts.org)... 13.35.254.13, 13.35.254.77, 13
Connecting to chem.libretexts.org (chem.libretexts.org)|13.35.254.13|:443... connecte
HTTP request sent, awaiting response... 302 Moved Temporarily
Location: https://files.mtstatic.com/site_4334/265970/0?Expires=1589777816&Signature=
--2020-05-18 04:16:31--  https://files.mtstatic.com/site_4334/265970/0?Expires=158977
Resolving files.mtstatic.com (files.mtstatic.com)... 143.204.201.91, 143.204.201.75,
Connecting to files.mtstatic.com (files.mtstatic.com)|143.204.201.91|:443... connecte
```

```
HTTP request sent, awaiting response... 200 OK
Length: 30286 (30K) [application/octet-stream]
Saving to: ‘auto-mpg.data’

     0K .......... .......... .........                        100% 11.2M=0.003s

2020-05-18 04:16:31 (11.2 MB/s) - ‘auto-mpg.data’ saved [30286/30286]
```

Once the data file has been loaded, use C++ code that you may normally use to read out the lines in the data file

---

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5.2.2: How to Incorporate Data Files in Your Code Blocks- For Julia

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using Julia Packages

Simply replace the URL of your data file in the below example code block to load your data in.

```
import Pkg; Pkg.add("HTTP")

import Pkg; Pkg.add("DelimitedFiles")

using HTTP
using DelimitedFiles
data = HTTP.get("https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data")

myCSV = readdlm(data.body)
```

run | restart | restart & run all

Method 2: Using wget or other shell commands

The second method that can be used to get a data file in your code block is with wget.. Note that the command is contained in backticks, not normal single quotes. Shell commands will not work with normal single quotes. Follow the example below and replace the example URL with the one attained in the previous step. Once the file is loaded, read and utilize it just as you would on your local computer.

```
run(`wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data`)
```

run | restart | restart & run all

Note: using the run command allows the user to run any shell command in Julia

---

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5.2.3: How to Incorporate Data Files in Your Code Blocks- For Octave

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using wget

The first method that can be used to get a data file in your code block is with wget. Follow the example below and replace the example URL with the one attained in the previous step.

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

run | restart | restart & run all

Remember to press the "Run" button prior to pressing "OK". Printing both the code and output will provide the below result, to avoid this simply check "Insert Code Only" after pressing "Run" in order to achieve the example above.

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

run | restart | restart & run all

```
--2020-05-18 19:05:11--
https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data


Resolving chem.libretexts.org (chem.libretexts.org)...
143.204.237.110, 143.204.237.44, 143.204.237.32, ...


Connecting to chem.libretexts.org
(chem.libretexts.org)|143.204.237.110|:443... connected.


HTTP request sent, awaiting response... 302 Moved Temporarily


Location: https://files.mtstatic.com/site_4334/265970/0?
Expires=1589831415&Signature=deYkXbnhzNZBqcjIiJo3JB9dUKqQbTOgTJdrlIvB6X
75QQ3Jg~Bojk~7yi35Zo2jLzQfksz32PccKApRDq9-
1iwejuMWTzTweFzdlQTVXfXV~g1iNTZGWni7QJQwJfG4_&Key-Pair-
Id=APKAJ5Y6AV4GI7A555NA [following]


--2020-05-18 19:05:11--
https://files.mtstatic.com/site_4334/265970/0?
Expires=1589831415&Signature=deYkXbnhzNZBqcjIiJo3JB9dUKqQbTOgTJdrlIvB6X
75QQ3Jg~Bojk~7yi35Zo2jLzQfksz32PccKApRDq9-
1iwejuMWTzTweFzdlQTVXfXV~g1iNTZGWni7QJQwJfG4_&Key-Pair-
Id=APKAJ5Y6AV4GI7A555NA


Resolving files.mtstatic.com (files.mtstatic.com)... 143.204.237.109,
```

```
143.204.237.108, 143.204.237.99, ...


Connecting to files.mtstatic.com
(files.mtstatic.com)|143.204.237.109|:443... connected.

HTTP request sent, awaiting response... 200 OK
Length: 30286 (30K) [application/octet-stream]
Saving to: ‘auto-mpg.data’

auto-mpg.data       100%[===================>]  29.58K  --.-KB/s    in
0.01s

2020-05-18 19:05:11 (2.18 MB/s) - ‘auto-mpg.data’ saved [30286/30286]
```

Once the data file has been loaded, use Octave code that you may normally use to read out the lines in the data file.
Octave also has the system() function which allows system commands to be run, for example:

```
system('wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data')
```

run | restart | restart & run all

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5.2.4: How to Incorporate Data Files in Your Code Blocks- For Python

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using wget

The first method that can be used to get a data file in your code block is with wget. Follow the example below and replace the example URL with the one attained in the previous step.

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

run | restart | restart & run all

Remember to press the "Run" button prior to pressing "OK". Printing both the code and output without, will the below result, to avoid this simply check "Insert Code Only" after pressing "Run".

```
!wget https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
```

run | restart | restart & run all

```
--2020-05-18 01:28:43--
https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data
Resolving chem.libretexts.org (chem.libretexts.org)... 143.204.39.66,
143.204.39.114, 143.204.39.103, ...
Connecting to chem.libretexts.org
(chem.libretexts.org)|143.204.39.66|:443... connected.
HTTP request sent, awaiting response... 302 Moved Temporarily
Location: https://files.mtstatic.com/site_4334/265970/0?
Expires=1589768697&Signature=c0dsv~bR3RQniUY5r-nXlduGKS~Az6ThF-
JmogVIJG2CWYV0oDujk8cDVGicmlVbR-
uverfdaQGQk~RSe2MqxK8CtJ8Io4Jc2YyAFg2WmjzPbWNWkpiUIzuxJvqJ~-
LnVjmIvjDVL5YWRBW1BhoEd59mNp0q9EHx1Mzbh7o36a4_&Key-Pair-
Id=APKAJ5Y6AV4GI7A555NA [following]
--2020-05-18 01:28:43--
https://files.mtstatic.com/site_4334/265970/0?
Expires=1589768697&Signature=c0dsv~bR3RQniUY5r-nXlduGKS~Az6ThF-
JmogVIJG2CWYV0oDujk8cDVGicmlVbR-
uverfdaQGQk~RSe2MqxK8CtJ8Io4Jc2YyAFg2WmjzPbWNWkpiUIzuxJvqJ~-
LnVjmIvjDVL5YWRBW1BhoEd59mNp0q9EHx1Mzbh7o36a4_&Key-Pair-
Id=APKAJ5Y6AV4GI7A555NA
Resolving files.mtstatic.com (files.mtstatic.com)... 52.85.79.99,
52.85.79.82, 52.85.79.53, ...
Connecting to files.mtstatic.com
(files.mtstatic.com)|52.85.79.99|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 30286 (30K) [application/octet-stream]
Saving to: ‘auto-mpg.data.1’

auto-mpg.data.1     100%[===================>]  29.58K  --.-KB/s    in
0.04s
```

```
2020-05-18 01:28:43 (708 KB/s) - ‘auto-mpg.data.1’ saved [30286/30286]
```

Once the data file has been loaded, use Python code that you may normally use to read out the lines in the data file. An example code block has been provided below.

```
inFile = open("auto-mpg.data", "r")

line = inFile.readline()

while True:
  line = inFile.readline()
  if line == "":
    break
  line = line.strip()
  lineList = line.split(',')
  print(lineList)
```

run | restart | restart & run all

To ensure that the above code block runs successfully, the user needs to run the wget code prior to running the above code if both parts are added in separately.

Method 2: Using Python Libraries

The CKEditor Binder Plugin supports Python 3, libraries that are supported by this version of Python may be used to read in the file. An example code block is provided below.

```
import csv
import urllib.request
import codecs

url = "https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data"
ftpstream = urllib.request.urlopen(url)
csvfile = csv.reader(codecs.iterdecode(ftpstream, 'utf-8'))
for line in csvfile:
  print(line)
```

run | restart | restart & run all

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5.2.5: How to Incorporate Data Files in Your Code Blocks- For R

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using read.csv

the url for the file can be saved to a variable or be added in all at once as shown below.



Login with LibreOne to run this code cell interactively.

If you have already signed in, please refresh the page.

Login

```
x <- read.csv(url("https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data")
print(x)
```

Keep in mind that larger data files will take longer to load.

Method 2: Using wget or curl through download.file

Another option to load in a data file is using wget or curl through the download.file function. An example code block is shown below, replace your url with the one in the example. For more information about the download.file function visit this link.



Login with LibreOne to run this code cell interactively.

If you have already signed in, please refresh the page.

Login

```
url <- "https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data"
z <- tempfile()
download.file(url,z,mode="wget")
file <- read.csv(z, sep = '\t')
print(file)
```

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5.2.6: How to Incorporate Data Files in Your Code Blocks- For SageMath

There are a number of ways data files and can be incorporated into code blocks. However, ensure that you have already followed the steps in the introduction to the CKEditor Binder Plugin Tutorial here.

Method 1: Using Libraries

The CKEditor Binder Plugin supports Python which is what SageMath runs on, libraries that are supported by our version of Python may be used to read in the file. An example code block is provided below. To reuse this, simply exchange the provided url with the one attained from your own page.

```
import csv
import urllib2
import ssl
import codecs

url = "https://chem.libretexts.org/@api/deki/files/265970/auto-mpg.data"
request = urllib2.Request(url)
response = urllib2.urlopen(request, context=ssl._create_unverified_context())
csvfile = csv.reader(codecs.iterdecode(response, 'utf-8'))
for line in csvfile:
  print(line)
```

run | restart | restart & run all

Here's a quick example of the things you can do using SageMath. Run the cell and your eyes will be blessed by a wonderful fully 3D parametric egg.

```
f = (lambda u,v: cos(u), lambda u,v: sin(u)+cos(v), lambda u,v: sin(v))
parametric_plot3d(f, (0,2*pi), (-pi,pi))
```

run | restart | restart & run all

This page titled 5.2.6: How to Incorporate Data Files in Your Code Blocks- For SageMath is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

5.2.7: Installing custom packages

The LibreTexts platform aims to be accommodating by already providing many commonly-used libraries and packages for use in code blocks. Unfortunately, authors may still find themselves in a position where they need a package that is not installed by default. If such a package is available in the Ubuntu 18.04 APT repositories or conda's conda-forge channel, the LibreTexts team can have it added for all code blocks upon request.

Installing a package that isn't available at either of the above locations is technically possible, though it is an **unsupported feature**.

General Instructions

For best results, any commands to install packages should be in the first code block of a page. To run a command in a Python, Octave, SageMath, or C++ code block, simply prepend the line with an exclamation mark. Examples of this in Python are shown below. Documentation on why this works in Python can be found here. Running commands in R code blocks can be accomplished through the use of system(). Octave also has a similar system() function. In Julia, this can be done through run().

One thing to keep in mind is that installing custom packages can increase the time it takes to run code by a significant amount. This may result in the code cell appearing to be frozen when it is in the process of downloading and installing packages. In such a case, it may be a good idea to include a print statement before any package installation commands letting anyone running the code cell that packages are currently being installed. Something along the lines of "Loading packages. This process may take up to x minutes. Please wait." will likely suffice.

Examples of Installing Custom Packages

Installing a conda package from the conda-forge channel

If an author wants to use a package that is available in the conda-forge channel, but not already installed on LibreTexts, they can do so as follows. To use the package pycrypto as an example:

```
1 !conda install -y pycrypto
```

The argument y is used here to automatically say yes to the package installation.

Installing other conda packages

If a conda package is desired that is not available in the conda-forge channel, the channel will have to specifically be specified. For the purposes of this example, assume that pycrypto is not available in conda-forge, but actually only from the "anaconda" channel. The command would then be as follows:

```
1 !conda install -y -c anaconda pycrypto
```

Notice the inclusion of the flag -c to specify the channel from which the package comes.

Using mamba instead of conda

An alternative to using the command *conda* for conda packages would be to use *mamba*. Mamba is a more recent and generally faster manager for conda packages. Syntax is identical between either command except for the replacement of *conda* for *mamba*. For example:

```
1 !mamba install -y pycrypto
```

One thing to keep in mind when using mamba is that it may output an alarming amount of text indicating the package is being installed. To prevent this from happening, authors may include the -q argument.

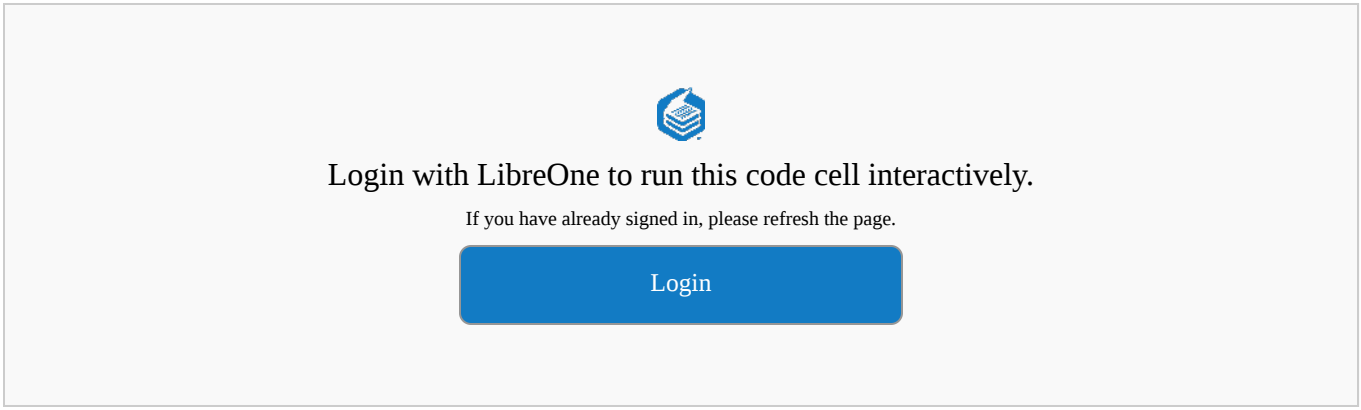
Installing a pip package

Following the previous examples, we simply include the pip install command in the first code block on the page. If an author wanted to use the times2 package, they could insert this line into their code:

```
1 !pip install times2
```

Real-time example

All of this working in action:




```
print("Installing dependencies. This process may take up to 5 minutes.")

!conda install -y pycrypto
!pip install times2
import times2
from Crypto import Random

print("pycrypto output:")
rndfile = Random.new()
print(rndfile.read(16))

print("times2 output:")
print(times2.now())
```

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5.2.7.1: Documentation of Supported Kernels

The LibreTexts platform lets you write, build, and run code within the text editor through the Binder Plugin. This plugin currently supports Python 3, Julia, R, Octave, SageMath, and C++. There are various kernels provided by the platform, which process the code that you type and display the results. Each of these kernels support and execute a specific programming language and version. When you select a language, the associated kernel is automatically launched, performs the computation, and produces the results. For example, the ipython kernel executes python code. A full list of all the Jupyter Kernels is available here. It includes all the information on each of the kernel's documentation, its installation process, supported languages and versions, and 3rd party dependencies. However, if you are only interested in knowing how to use the supported kernels, refer to the following documentations or examples:

- Python3 - IPython
- Julia - IJulia
- R - IRKernel
- Octave - octave_kernel
- SageMath - SageMath
- C++ - xeus-cling

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5.2.8: Using ipywidgets for Interactivity

In order to produce interactive plots and figures, Python modules such as ipywidgets provide a set of widgets which you may embed into your Libretexts page.

First, we will import all of our dependencies. You may `import ipywidgets` directly, or you can pick specific widgets to import as done below. Even though the rest of the code is separated into different code blocks, each Libretexts page will "remember" all of the imports done on that page, so we only need to do this once at the beginning.



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Login

```
import ipywidgets as widgets
import matplotlib.pyplot as plt
import numpy as np
```

Next, lets define some functions to help us make an interactive matplotlib sine graph.



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```
x = np.linspace(0,10)

def sine_func(x, w, amp):
    return amp*np.sin(w*x)
```

Next, we define our updating function. Generally, this is a function that will accept the widget values and then adjust the data of our plot accordingly. The function below will take the values from our amplitude and frequency widgets as its parameters and then create a new set of y values. Interact passes these values to the function through the sliders.

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Login

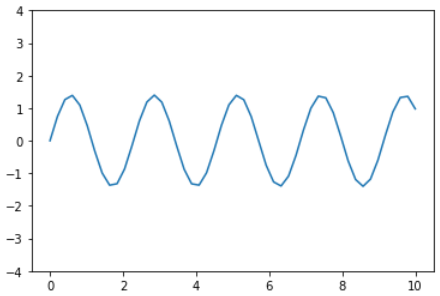
```
@widgets.interact(w=(0, 4, 0.25), amp=(0, 4, .1))
def update(w = 1, amp = 1):
    plt.clf()
    plt.ylim(-4, 4)
    plt.plot(x, sine_func(x, w, amp))
```

w

2.75

amp

1.40



The easiest way to to display an interactive plot with ipywidgets is with the interact() function as shown above, though there are far more features available through ipywidgets that users are encouraged to explore on their own.

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5.2.8.1: Enabling and Using Interactive Matplotlib Features

Matplotlib is a Python library which supports a broad range of plotting functions and features. If you have ever created and displayed a plot using `matplotlib` yourself, then you may have noticed that the plot has some interactive features allowing you to pan, reset view, save the image, and more. These features are not available by default on Libretexts, but by using the ipympl widget you can enable all of those same functions for your plots. We will follow a short and simple example to demonstrate this.

To compare, run the following cell and check the output. Without the `ipympl` widget, `matplotlib` plots will simply appear like an embedded image.

```
import matplotlib.pyplot as plt
import numpy as np

fig = plt.figure()
plt.plot(np.sin(np.linspace(0, 20, 100)));
```

run | restart | restart & run all

Next, we will enable the `ipympl` backend which controls the interactive features of `matplotlib` and then we will draw a 3D plot, because we can. Run the code, and you should see that there is a vertical toolbar on the left-hand side of the plot which allows us to interact with the figure. At the moment, this toolbar does not work perfectly with 3D plots on Libretexts, so you may find that the 'rest original view' and 'forward/previous view' buttons do not work. You may still freely rotate the plot around.

```
# Enable the ipympl backend with the following line
%matplotlib widget

from mpl_toolkits.mplot3d import axes3d

fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
X, Y, Z = axes3d.get_test_data(0.05)
ax.plot_wireframe(X, Y, Z, rstride=10, cstride=10)
plt.show()
```

run | restart | restart & run all

Once the widget is enabled, that change will persist throughout the whole page until the kernel is restarted (either by explicitly pressing the 'restart' button or by refreshing the page). If you go back and rerun the first cell after the one directly above, you will notice that it also has interactive features enabled. Whichever widget you have most recently enabled within a kernel session is the one that will be activated for the entire webpage. To return to the static plotting images, use `%matplotlib inline` . This allows you to include both static and interactive plots on your Libretexts page; just call the relevant `%matplotlib` magic command and you can switch between the two styles.

```
%matplotlib inline

fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
X, Y, Z = axes3d.get_test_data(0.05)
```

```
ax.plot_wireframe(X, Y, Z, rstride=10, cstride=10)
plt.show()
```

run | restart | restart & run all

You can also adjust the interactive features of your plot with `fig.canvas` booleans. The next cell demonstrates this by disabling the header, toolbox, and footer. You can find more options like this on this ipympl example page. Current limitations of the Libretexts code cell plugin prevent later code cells from interacting with earlier ones, so you will have to set all your `fig.canvas` options within the same cell that you display the plot.

```
%matplotlib widget

fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')
X, Y, Z = axes3d.get_test_data(0.05)
ax.plot_wireframe(X, Y, Z, rstride=10, cstride=10)
plt.show()

fig.canvas.toolbar_visible = False
fig.canvas.header_visible = False
fig.canvas.footer_visible = False
```

run | restart | restart & run all

The github page for `ipympl` and usage guide for `matplotlib` are two external resources that may help you debug your code. If you run into any bugs or difficulties and those websites still do not resolve your issue, feel free to email us at jupyterteam@ucdavis.edu and we can provide you with more assistance.
The ipywidgets also work with ipympl. For example:

```
%matplotlib widget
import ipywidgets as widgets
import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(0,10)

def sine_func(x, w, amp):
    return amp*np.sin(w*x)

@widgets.interact(w=(0, 4, 0.25), amp=(0, 4, .1))
def update(w = 1, amp = 1):
    plt.clf()
    plt.ylim(-4, 4)
    plt.plot(x, sine_func(x, w, amp))
```

run | restart | restart & run all



Figure 1

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5.2.8.2: Using ipyleaflet for Interactive Mapping

The ipyleaflet Jupyter package for Python allows you to use the powerful interactive mapping features of Leafletjs within Jupyter and Libretexts documents. Here's a short example to demonstrate what can be done with ipyleaflet on Libretexts.

First we import the packages we'll need to use.



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```
from ipyleaflet import Map, Heatmap
from random import uniform
import time
```

Then, we'll declare and display a map of the world.



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```
m = Map(center=[0, 0], zoom=2)
m
```

Next, we can make a function to generate random heat maps and overlay them onto our existing map.



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Login

```
def create_random_data(length):
    "Return a list of some random lat/lon/value triples."
    return [[uniform(-80, 80),
             uniform(-180, 180),
             uniform(0, 1000)] for i in range(length)]

heat = Heatmap(locations=create_random_data(1000), radius=20, blur=10)
m.add_layer(heat)
```

Then, we can even animate it as follows:



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Login

```
for i in range(100):
    heat.locations = create_random_data(1000)
    time.sleep(0.1)

heat.radius = 30
heat.blur = 50
heat.max = 0.5
heat.gradient = {0.4: 'red', 0.6: 'yellow', 0.7: 'lime', 0.8: 'cyan', 1.0: 'blue'}
heat.locations = [[uniform(-80, 80), uniform(-180, 180), uniform(0, 1000)] for i in r
```

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5.2.8.3: Using ipyvolume for 3D plotting

The ipyvolume package for Python allows for 3d plotting straight in LibreTexts code blocks.

A quick example, taken from the ipyvolume docs, showcases ipyvolume's ability to render three-dimensional objects with sliders to adjust attributes in real time.

Because ipyvolume isn't included by default, we need to install it via pip at the top of the code block.

```
!pip install ipyvolume -q
import numpy as np
import ipyvolume as ipv
V = np.zeros((128,128,128)) # our 3d array
# outer box
V[30:-30,30:-30,30:-30] = 0.75
V[35:-35,35:-35,35:-35] = 0.0
# inner box
V[50:-50,50:-50,50:-50] = 0.25
V[55:-55,55:-55,55:-55] = 0.0
ipv.quickvolshow(V, level=[0.25, 0.75], opacity=0.03, level_width=0.1, data_min=0, da
```

run restart restart & run all

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5.2.8.4: Using nglview to view molecular structures and trajectories

The package nglview can be used to generate and render complex molecular visualizations. These can be explored with the mouse by dragging to move the view and scrolling to zoom in/out.

Because visualizations can quickly become complex, it is recommended to check out the documentation of nglview to get a full grasp of how to use it.

An example is shown below:



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Login

```
import nglview as nv

view = nv.show_structure_file(nv.datafiles.PDB)
view
```

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5.2.8.5: Using pythreejs to generate and view three-dimensional models

It is possible to use output from pythreejs in Libretexts pages. The examples below are taken from the pythreejs documentation and are licensed under the BSD 3-Clause License.

Primitive 3D shapes can be constructed and viewed as follows. Click and drag to explore the shape.



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```
from pythreejs import BoxGeometry
BoxGeometry(
    width=5,
    height=10,
    depth=15,
    widthSegments=5,
    heightSegments=10,
    depthSegments=15)
```

More complex shapes can be constructed and viewed as well:



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```
from IPython.display import display
from pythreejs import (ParametricGeometry, Mesh, PerspectiveCamera, Scene,
                       MeshLambertMaterial, DirectionalLight, AmbientLight,
                       Renderer, OrbitControls, PerspectiveCamera)

f = """
function f(origu, origv, out) {
    // scale u and v to the ranges I want: [0, 2*pi]
    var u = 2*Math.PI*origu;
    var v = 2*Math.PI*origv;

    var x = Math.sin(u);
    var y = Math.cos(v);
    var z = Math.cos(u+v);

    out.set(x,y,z);
}
"""
surf_g = ParametricGeometry(func=f, slices=16, stacks=16)

surf = Mesh(geometry=surf_g, material=MeshLambertMaterial(color='green', side='FrontS
surf2 = Mesh(geometry=surf_g, material=MeshLambertMaterial(color='yellow', side='Back
c = PerspectiveCamera(position=[5, 5, 3], up=[0, 0, 1],
                      children=[DirectionalLight(color='white',
                                                 position=[3, 5, 1],
                                                 intensity=0.6)])
scene = Scene(children=[surf, surf2, c, AmbientLight(intensity=0.5)])
renderer = Renderer(camera=c, scene=scene, controls=[OrbitControls(controlling=c)], w
display(renderer)
```

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5.2.8.6: Using bqplot to make interactive plots

Libretexts authors can utilize the bqplot Jupyter widget, a 2D plotting library, in their textbooks. This example is repurposed from the bqplot documentation and is licensed under the Apache License 2.0 License.



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Login

```
import numpy as np
from bqplot import pyplot as plt

size = 100
np.random.seed(0)
x_data = np.arange(size)
y_data = np.cumsum(np.random.randn(size)  * 100.0)

plt.figure(title='My First Plot')
plt.plot(x_data, y_data)
plt.show()
```

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5.2.8.7: Using IPyCytoscape to visualize graphs

Libretexts authors can create code blocks that utillize the ipyctyoscape package to create cytoscape.js graphs. Below is an example taken from the ipycytoscape repository and is licensed under the BSD 3-Clause License.

```
import ipycytoscape
data = {
  'nodes': [
      { 'data': { 'id': 'desktop', 'name': 'Cytoscape', 'href': 'http://cytoscape.org
      { 'data': { 'id': 'a', 'name': 'Grid', 'href': 'http://cytoscape.org' } },
      { 'data': { 'id': 'b', 'name': 'Cola', 'href': 'http://cytoscape.org' } },
      { 'data': { 'id': 'c', 'name': 'Popper', 'href': 'http://cytoscape.org' } },
      { 'data': { 'id': 'js', 'name': 'Cytoscape.js', 'href': 'http://js.cytoscape.or
  ],
  'edges': [
      {'data': { 'source': 'desktop', 'target': 'js' }},
      {'data': { 'source': 'a', 'target': 'b' }},
      {'data': { 'source': 'a', 'target': 'c' }},
      {'data': { 'source': 'b', 'target': 'c' }},
      {'data': { 'source': 'js', 'target': 'b' }}
  ]
}
cytoscapeobj = ipycytoscape.CytoscapeWidget()
cytoscapeobj.graph.add_graph_from_json(data)
cytoscapeobj.set_style([{
  'selector': 'node',
  'css': {
      'content': 'data(name)',
      'text-valign': 'center',
      'color': 'white',
      'text-outline-width': 2,
      'text-outline-color': 'green',
      'background-color': 'green'
  }
  },
  {
  'selector': ':selected',
  'css': {
      'background-color': 'black',
      'line-color': 'black',
      'target-arrow-color': 'black',
      'source-arrow-color': 'black',
      'text-outline-color': 'black'
  }}
  ])
cytoscapeobj
```

run | restart | restart & run all

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SECTION OVERVIEW

5.3: The Hypothesis Annotation System

Hypothes.is is an open-source software project that aims to collect comments about statements made in any web-accessible content, and filter and rank those comments to assess each statement's credibility. It has been summarized as "a peer review layer for the entire Internet." The hypothesis system is native on all LibreTexts libraries and can be accessed via the lurking buttons on the upper right of each page (see arrow in Figure below for Klymkoswsky and Cooper's Biofundamentals text on the biology library.

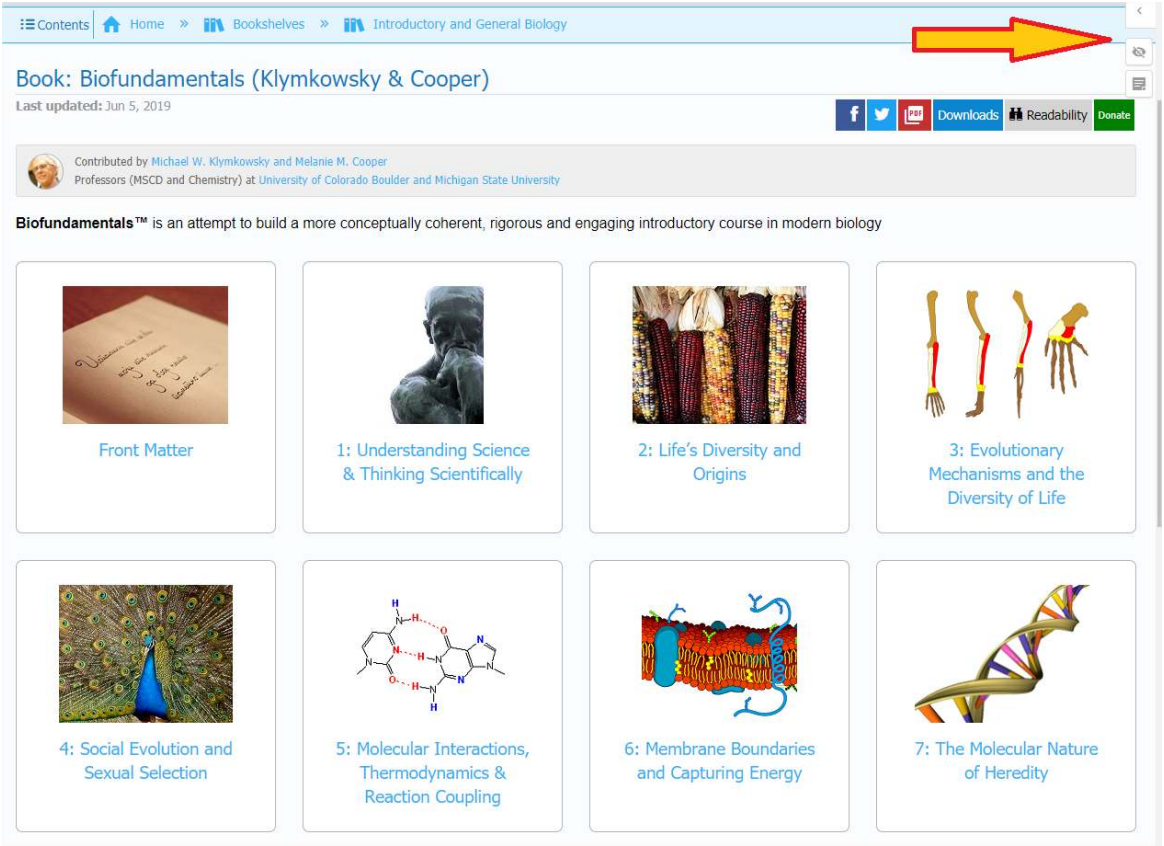


Figure 5.3.1: How to access Hypothesis. https://bio.libretexts.org/link?3879

To use the hypothesis system, an account has to be registered with hypothesis (free to all). That can be set up easily by clicking on the hypothesis button (see above), which expands the application on the LibreTexts (see Figure below).

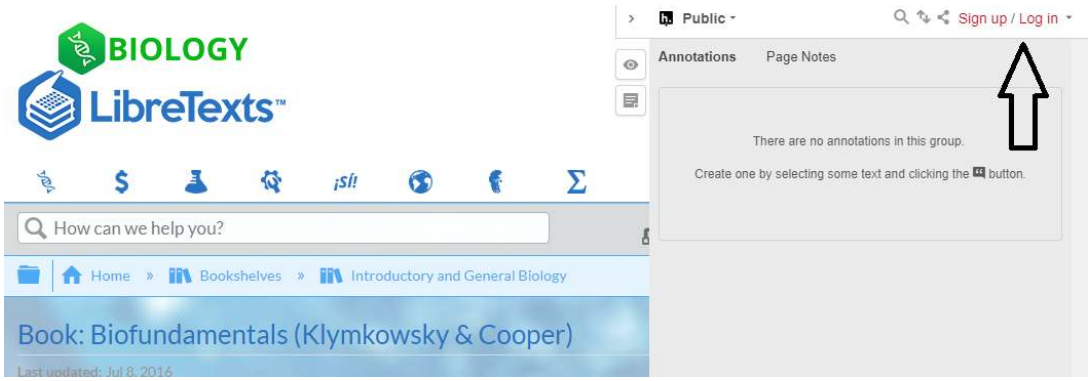


Figure 5.3.2: Sign into Hypothesis.

After successfully logging in, users can then use the system directly on LibreTexts pages. There is even a small HowTo menu once logged in (see figure below).

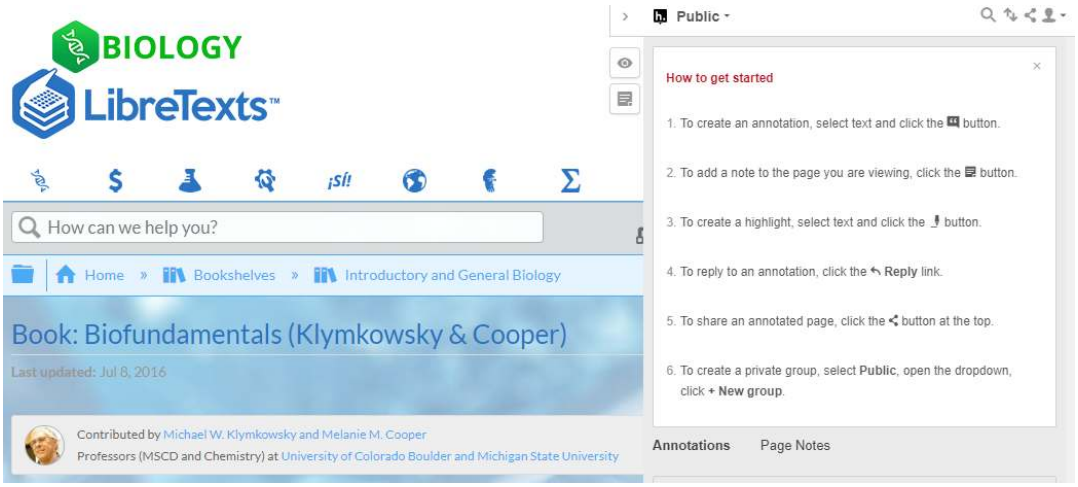


Figure 5.3.3: Selection private or public annotation permissions.

Method 1: Note taking

Just general annotation/notes (for students or faculty) requires logging in and highlighting some text. An automatic option will show up asking if user wants to annotate that text (on that page). For example, if a user wants to either (hypothesis) highlight a section or provide an annotation on that section, all they need to do is drag the mouse to highlight the area and click on either option that pops up (see Figure below).



Figure 5.3.4: Select text will automatically select hypothesis options: annotation or highlighting.

Method 2: Contextual Chat Rooms and Meta-Discussions

If you want to use hypothesis as a contextual chat room with students posting questions right next to content for faculty to engage them on those questions, then a closed group for your class needs to be set up. In the absence of a group, all annotation and highlights are publicly viewable.

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5.3.1: Hypothes.is Web Annotations

Introduction

Integrated into LibreText is the hypothes.is web annotation service. This service allows you to highlight text and make notes (annotations) in a collapsable overlay that you can share with your class or keep private. Annotations can be used in two fundamentally different ways. First, through the proper use of tags you can use it to organize your notes and prepare for exams, quizzes and laboratory experiments. Second, if annotations are posted to your class group you can use it as a tool to communicate with your instructor and other students. If someone replies to your annotation an email is triggered to the email that is associated with your hypothes.is account. The following 4:53 min youtube gives a quick overview of the use of Hypothes.is with LibreText.



Video 5.3.1.1: Overview of the use of hypothes.is within LibreTexts (uploaded by R.E.Belford). The overlay on the right side of the image allows you to make notes and tag your annotation. You can even embed images and YouTube videos in the overlay.

You do not need to create an account at Hypothes.is to read public annotations but you do need one to make an annotation or read annotations to the class group. If you install the Hypothes.is extension on your browser you can also annotate and tag any open access webpage, and through proper use of tags can organize it within your notes in a manner that fits within your LibreText assignments. Hypothes.is also generates a "contextual link" that allows you to share your annotation with your instructor and classmates. This link opens the webpage in a new browser window, scrolls down to the highlighted text and opens your annotation in the overlay. Hypothes.is works on PDFs too.

Making an Account

Go to https://web.hypothes.is/ and follow the steps outlined in figure 5.3.1.1.

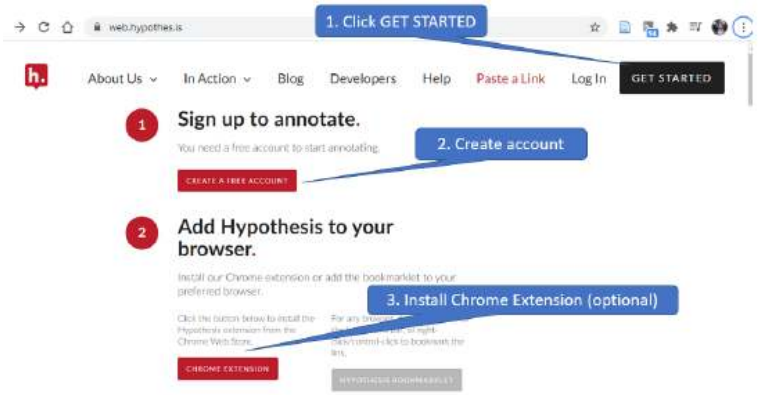


Figure 5.3.1.1: Steps for creating a hypothes.is account at https://web.hypothes.is/. (Copyright; R.E.Belford CC0)

You do not need the chrome extension to make annotations within LibreTexts, but do if you wish to annotate other pages on the web.

Making Annotations

To make an annotation you simply highlight the text you want to annotate, choose "Annotate" and write in the overlay. Note, the first time you open up a page it will post to "Public" and you need to change that to your class group. Once you have started posting to the class group it will be the default option, but initially the default is public.

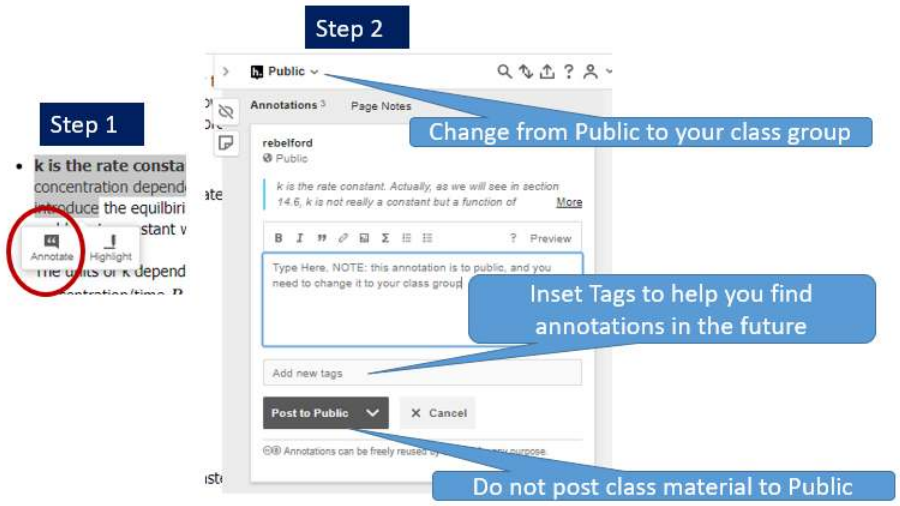


Figure 5.3.1.2: To annotate you simply highlight text and write in the overlay. (Copyright; Belford, cc.0)

If you tag your annotation you can easily find it by going to your homepage in hypothes.is and then filtering by tags. So you may want to make tags like "exam 1", or "nomenclature". If you then filter with your hypothes.is user name and exam 1, you see those items you tagged (see video 5.3.1.1 at 3:00 min. If you just do exam 1, you filter for everything the class tagged exam 1. You can then click the contextual link by the annotation, and hypothes.is will open that page, navigate to the highlighted text and display the annotation. (Note: In LibreText the highlights are hidden by default, and you need to click the "eye" with the slash over it (figure 5.3.1.2

Using the Hypothes.is overlay to read discussions

By default the hypothes.is overlay is closed and you do not see the annotations.

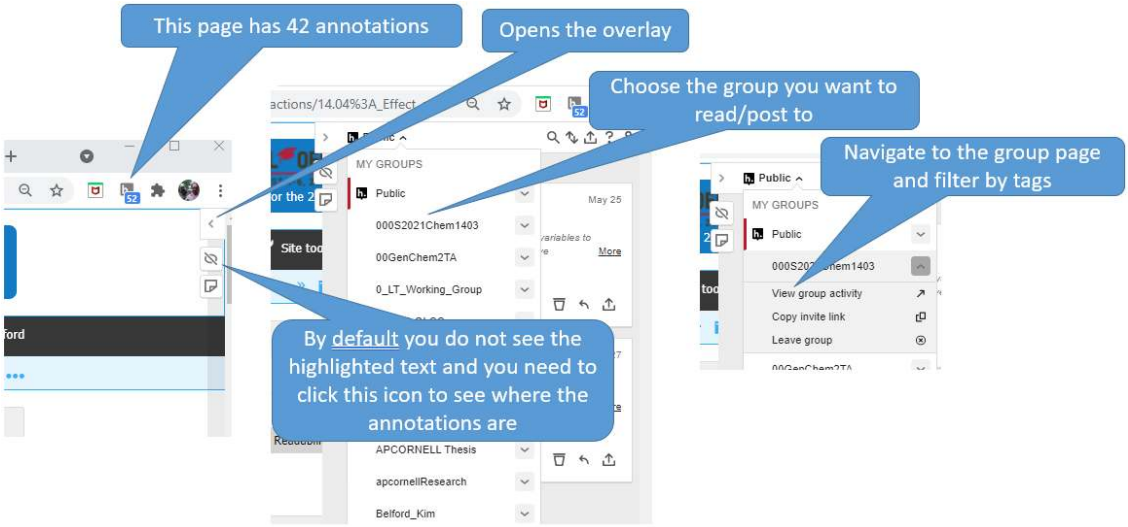


Figure 5.3.1.2: By default the overlay is closed and annotations are hidden. This image shows how to pick a group and view group activity (Copyright; Belford CC0)

Figure 5.3.1.3shows how to pick a group and view group activity.

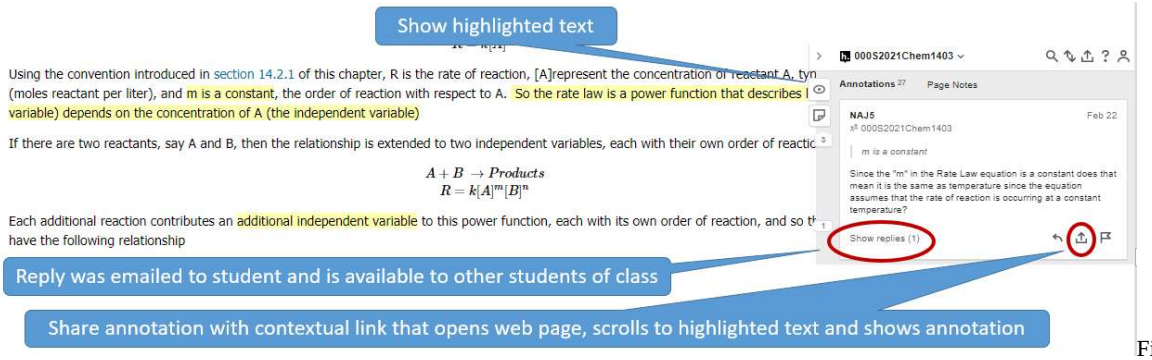


Figure 5.3.1.4: Annotation and highlights text being displayed. (Copyright; Belford CC0)

Using tags

Tags are a very powerful way of organizing your notes and Hypothes.is has different types of tags. When in figure 5.3.1.2 the overlay was changed from "Public" to your class group, a tag of the type "group" was being used to filter the results in the overlay. If you navigate to your group page in hypothes.is (right side of figure 5.3.1.3) you enter your class page in hypothes.is, where you can see all the annotations to your group (top of figure 5.3.1.5 shows 148 annotations to the 2020 IOST class group). Only members of the group can see annotations with this type of tag, and you also see two other types of tags, the ones the members of the group posted to the pages being shown [tag type=tag] and the members of the group [tag type= user]. This allows you to filter the results to those of a group (top of 5.3.1.5) , those of the group and a particular tag (middle of figure 5.3.1.5), and those of a tag and a specific person in the group (bottom of figure 5.3.1.5).

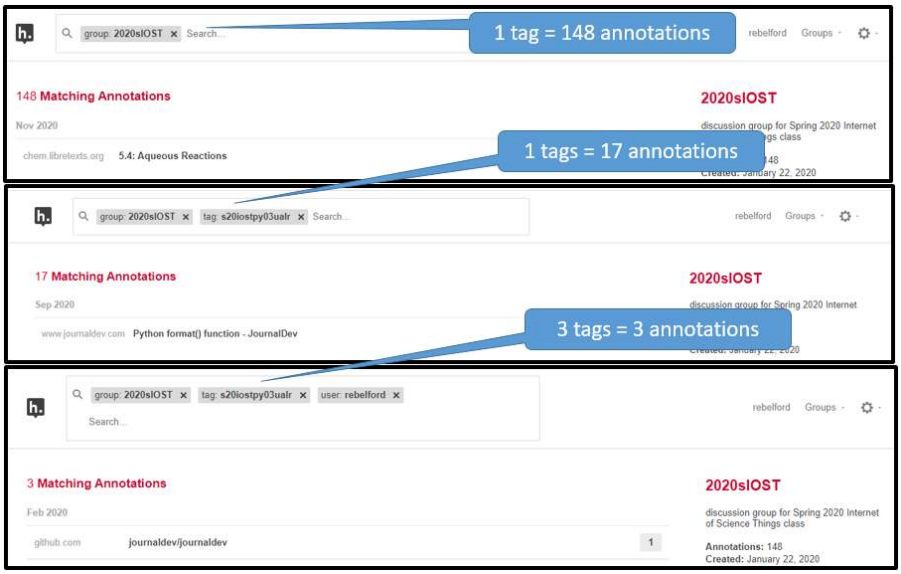


Figure 5.3.1.5: Use of Hypothes.is website to filter tags of a LibreText class. Note three types of tags are being used; "group" (class), "tag" & "user" (Copyright; Belford CC-BY)

If you click on any annotation you will see what was highlighted, what the comment was, and a contextual link that navigates to the annotation in the document and opens the annotation in the overlay. Annotations are thus a powerful tool to organize your notes and to communicate with students and instructors.

Note: Tags and Metacognition

Metacognition is "thinking about thinking" and a powerful tool to improve your study habits. When you highlight text and make annotations in the process of studying you connecting what you are reading to what you think is important to know, and tagging adds a deeper layer to the organization of your notes. Careful thought should be made when choosing tags, and you should always use the autofill option (you do not want two tags for the same concept like molecule and molecules, unless there is something different between the meaning of the two tags). You should practice at filtering tags within the hypothes.is website as that is how you can refine your notes from general categories to specific items. But most important you should think about what you annotate and how you tag it, find out what works best for you, and that is literally the definition of metacognition. So experiment and find out what works best for you.

This page titled 5.3.1: Hypothes.is Web Annotations is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

5.4: Interactive Molecules and Proteins - Direct Embedding

Our molecule adding video tutorial on YouTube: youtu.be/-Md0Y90LhyY

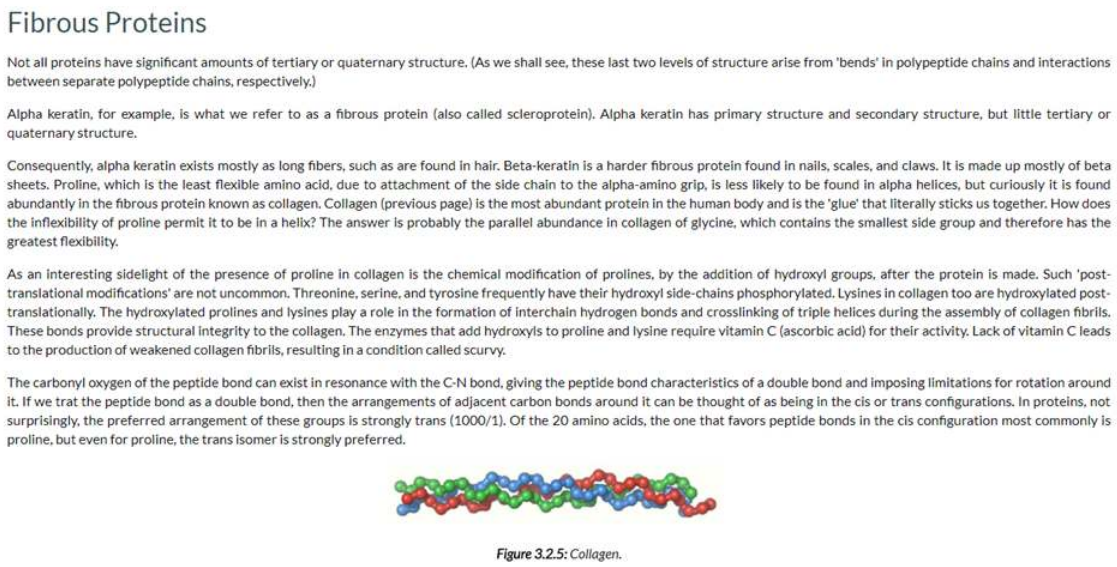
An interactive protein/chemical can be embedded into pages via the following steps. A more advanced Molecule Generator is discussed elsewhere.

Step 1: Identify the page you want to edit

For example, let's say we want to edit this page:

https://bio.libretexts.org/TextMaps/Map%3A_Biochemistry_Free_and_Easy_(Ahern)/03%3A_Structure_and_Function/3.2%3A_Proteins

and swap out the collagen image for an interactive image



Fibrous Proteins

Not all proteins have significant amounts of tertiary or quaternary structure. (As we shall see, these last two levels of structure arise from 'bends' in polypeptide chains and interactions between separate polypeptide chains, respectively.)

Alpha keratin, for example, is what we refer to as a fibrous protein (also called scleroprotein). Alpha keratin has primary structure and secondary structure, but little tertiary or quaternary structure.

Consequently, alpha keratin exists mostly as long fibers, such as are found in hair. Beta-keratin is a harder fibrous protein found in nails, scales, and claws. It is made up mostly of beta sheets. Proline, which is the least flexible amino acid, due to attachment of the side chain to the alpha-amino grip, is less likely to be found in alpha helices, but curiously it is found abundantly in the fibrous protein known as collagen. Collagen (previous page) is the most abundant protein in the human body and is the 'glue' that literally sticks us together. How does the inflexibility of proline permit it to be in a helix? The answer is probably the parallel abundance in collagen of glycine, which contains the smallest side group and therefore has the greatest flexibility.

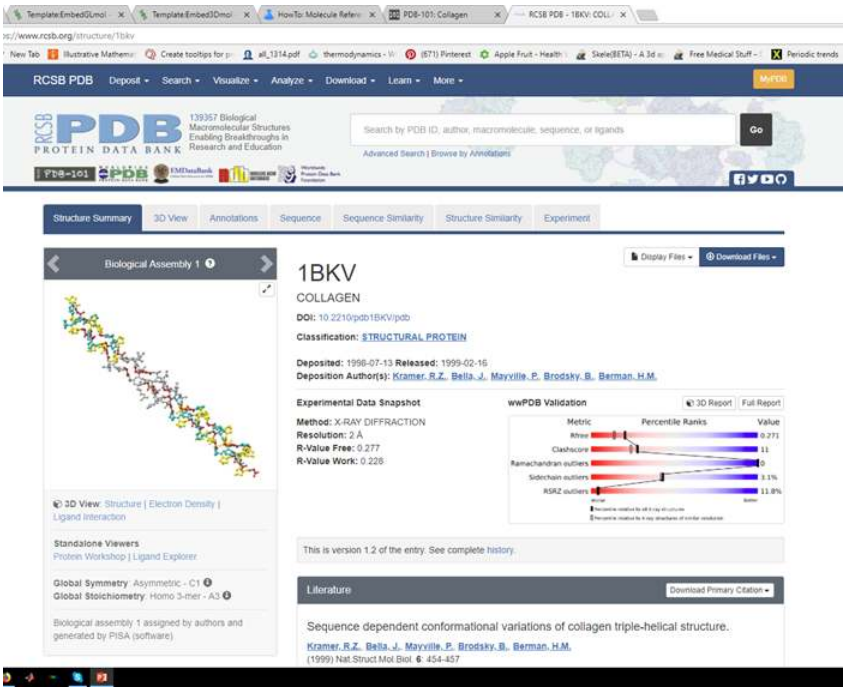
As an interesting sidelight of the presence of proline in collagen is the chemical modification of prolines, by the addition of hydroxyl groups, after the protein is made. Such 'post-translational modifications' are not uncommon. Threonine, serine, and tyrosine frequently have their hydroxyl side-chains phosphorylated. Lysines in collagen too are hydroxylated post-translationally. The hydroxylated prolines and lysines play a role in the formation of interchain hydrogen bonds and crosslinking of triple helices during the assembly of collagen fibrils. These bonds provide structural integrity to the collagen. The enzymes that add hydroxyls to proline and lysine require vitamin C (ascorbic acid) for their activity. Lack of vitamin C leads to the production of weakened collagen fibrils, resulting in a condition called scurvy.

The carbonyl oxygen of the peptide bond can exist in resonance with the C-N bond, giving the peptide bond characteristics of a double bond and imposing limitations for rotation around it. If we trat the peptide bond as a double bond, then the arrangements of adjacent carbon bonds around it can be thought of as being in the cis or trans configurations. In proteins, not surprisingly, the preferred arrangement of these groups is strongly trans (1000/1). Of the 20 amino acids, the one that favors peptide bonds in the cis configuration most commonly is proline, but even for proline, the trans isomer is strongly preferred.

Figure 3.2.5: Collagen.

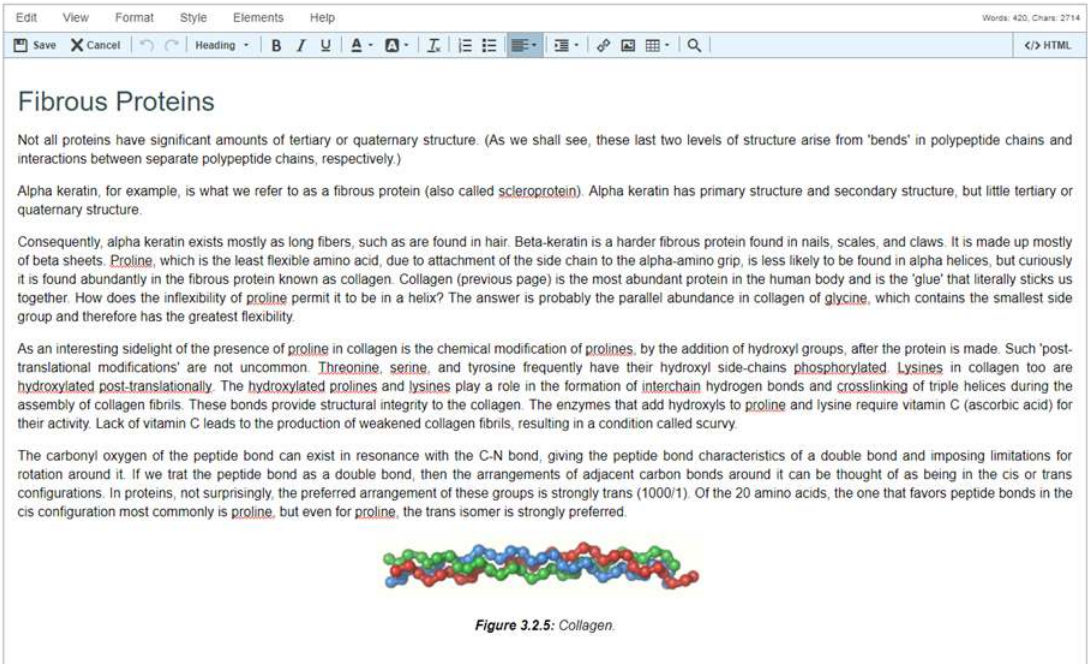
Step 2: Identify the desired ID code

There are several ways, but best to just grab the PDB code. From the PDB, we can see the code we want is 1BKV: https://www.rcsb.org/structure/1bkv

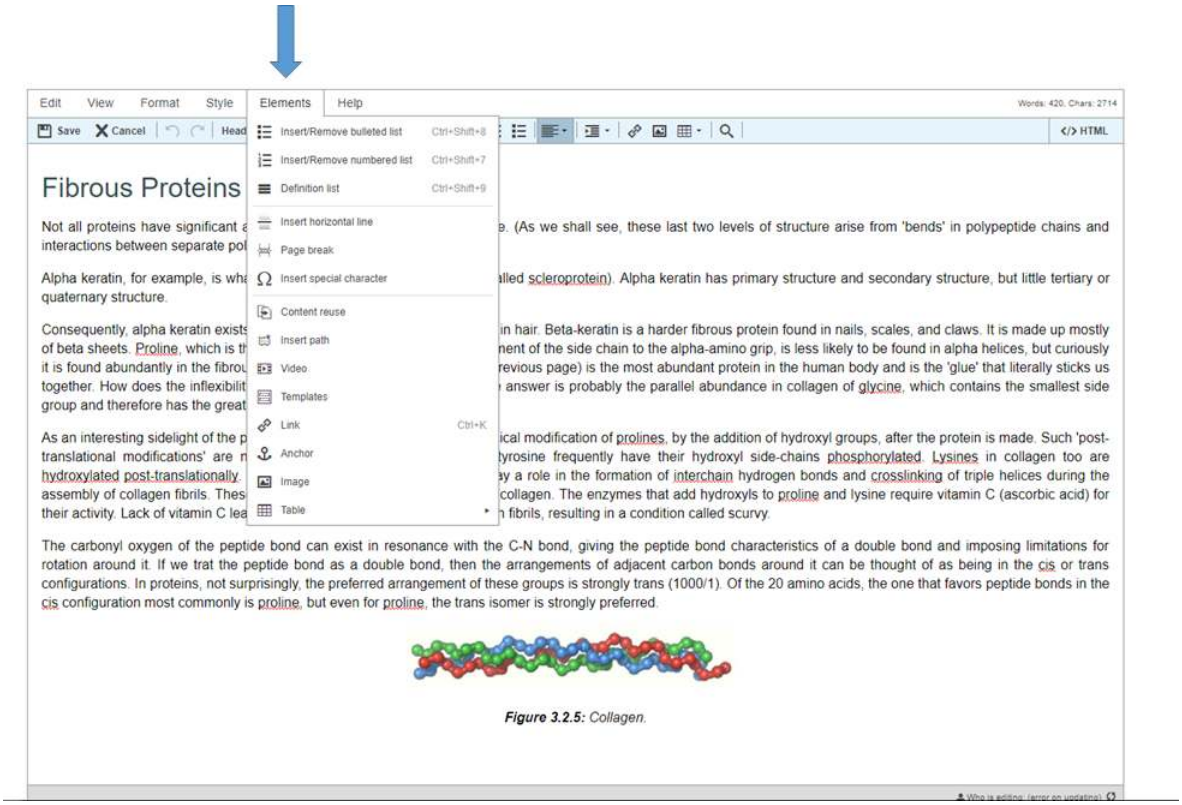


Step 3: Edit the page (in edit mode)

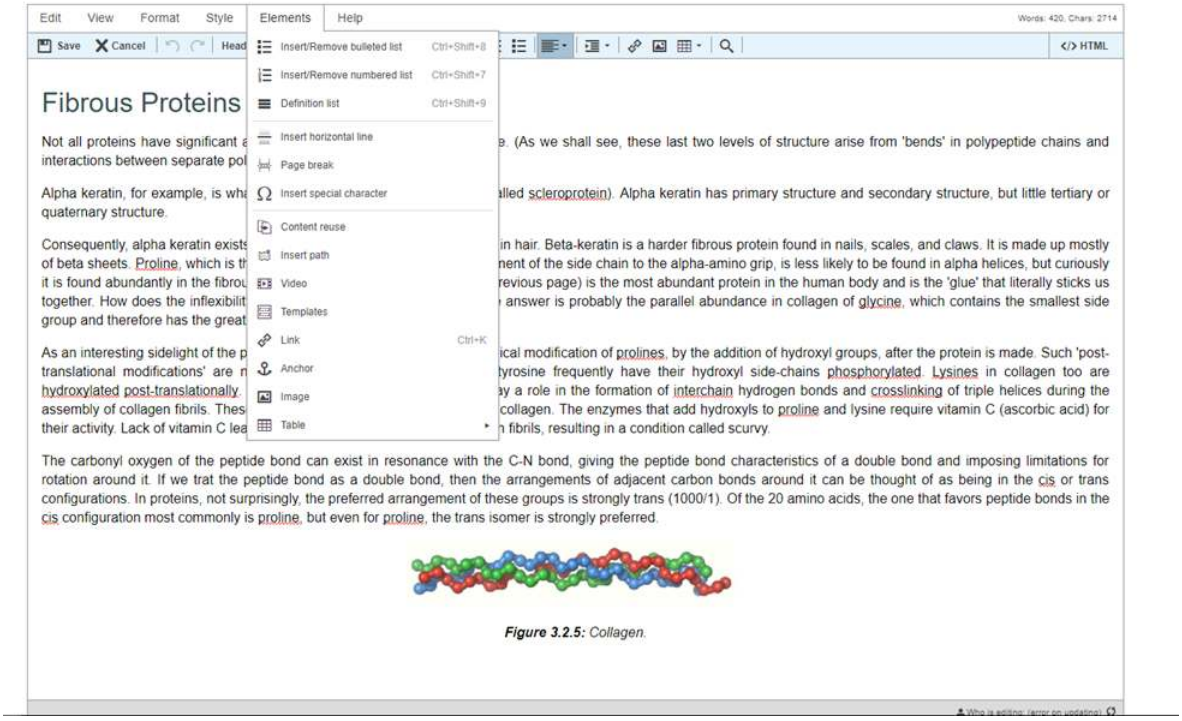
Edit the page using "Edit" on black bar.



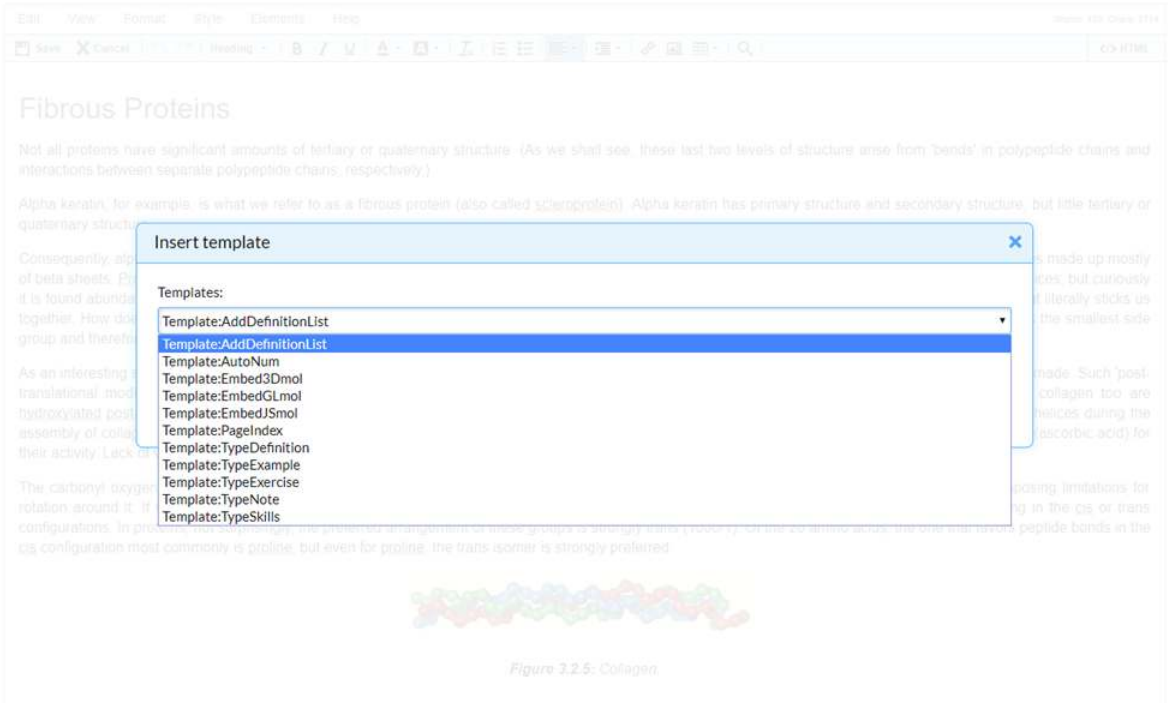
Step 4: Press Elements on toolbar



Step 5: Press Templates on toolbar

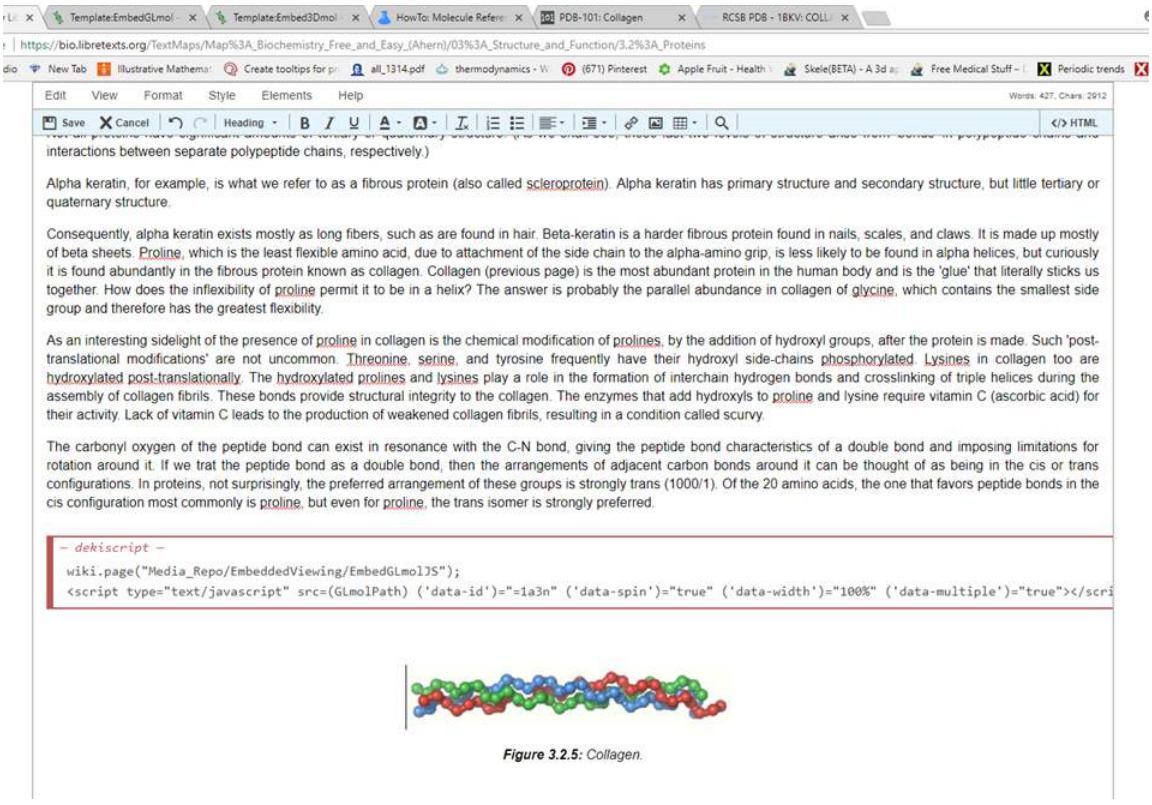


Step 6: Press “EmbedGLMol” and when queried press “Insert template”



Step 7: Edit Code

The above steps insert this red box with code. You can edit the second line (<script type…) accordingly. The simple thing is to change the code "=1a3n" to the PDB code you desire, in this case "=1bkv" and save



Step 8: Review

Review and if cool, we erase the old image (but keep the caption). There are many options to this system and we are still working them out, but you can see them in the Molecular Generator:

https://chem.libretexts.org/Visualiz...cule_Reference

sheets. Proline, which is the least flexible amino acid, due to attachment of the side chain to the alpha-amino grip, is less likely to be found in alpha helices, but curiously it is f abundantly in the fibrous protein known as collagen. Collagen (previous page) is the most abundant protein in the human body and is the 'glue' that literally sticks us together. How the inflexibility of proline permit it to be in a helix? The answer is probably the parallel abundance in collagen of glycine, which contains the smallest side group and therefore ha greatest flexibility.

As an interesting sidelight of the presence of proline in collagen is the chemical modification of prolines, by the addition of hydroxyl groups, after the protein is made. Such ' translational modifications' are not uncommon. Threonine, serine, and tyrosine frequently have their hydroxyl side-chains phosphorylated. Lysines in collagen too are hydroxylated translationally. The hydroxylated prolines and lysines play a role in the formation of interchain hydrogen bonds and crosslinking of triple helices during the assembly of collagen fi These bonds provide structural integrity to the collagen. The enzymes that add hydroxyls to proline and lysine require vitamin C (ascorbic acid) for their activity. Lack of vitamin C to the production of weakened collagen fibrils, resulting in a condition called scurvy.

The carbonyl oxygen of the peptide bond can exist in resonance with the C-N bond, giving the peptide bond characteristics of a double bond and imposing limitations for rotation ar it. If we trat the peptide bond as a double bond, then the arrangements of adjacent carbon bonds around it can be thought of as being in the cis or trans configurations. In protein surprisingly, the preferred arrangement of these groups is strongly trans (1000/1). Of the 20 amino acids, the one that favors peptide bonds in the cis configuration most commo proline, but even for proline, the trans isomer is strongly preferred.

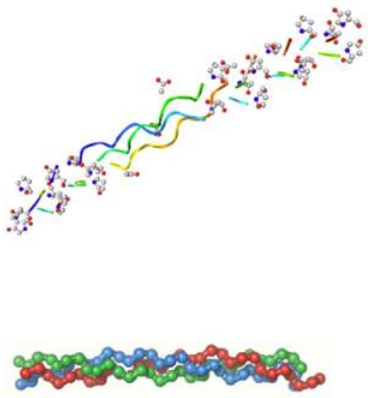


Figure 3.2.5: Collagen.

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5.5: Interactive Molecule and Protein - Molecule Generator

The seven steps (from start to finish) for embedding interactive proteins/molecules via the molecular generates are:

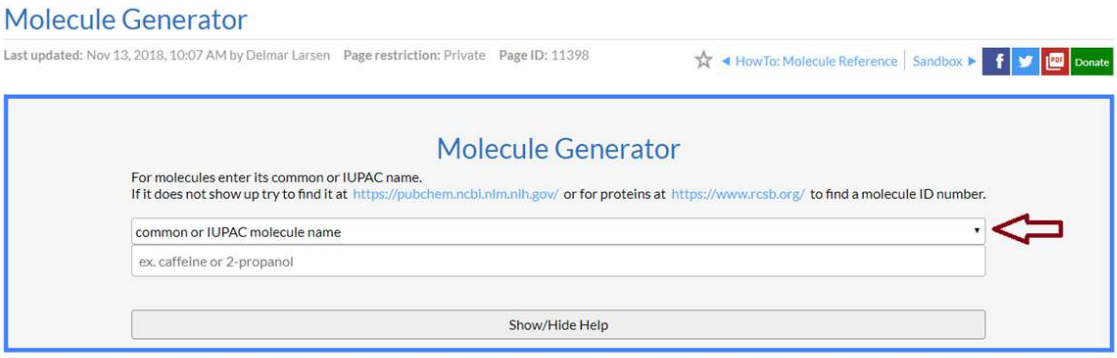
- Step 1 (Prepare the image)
- Step 2 (Copy Code)
- Step 3 (Navigation and Edit)
- Step 4 (prepaste)
- Step 5 (paste)
- Step 6 (save and tag)
- Step 7 (refresh)

Step 1: Prepare the image

Step 1 (Prepare the image): Go to

https://bio.libretexts.org/Visualizations_and_Simulations/Molecular_and_Protein_Interactive_Figures/Molecule_Generator

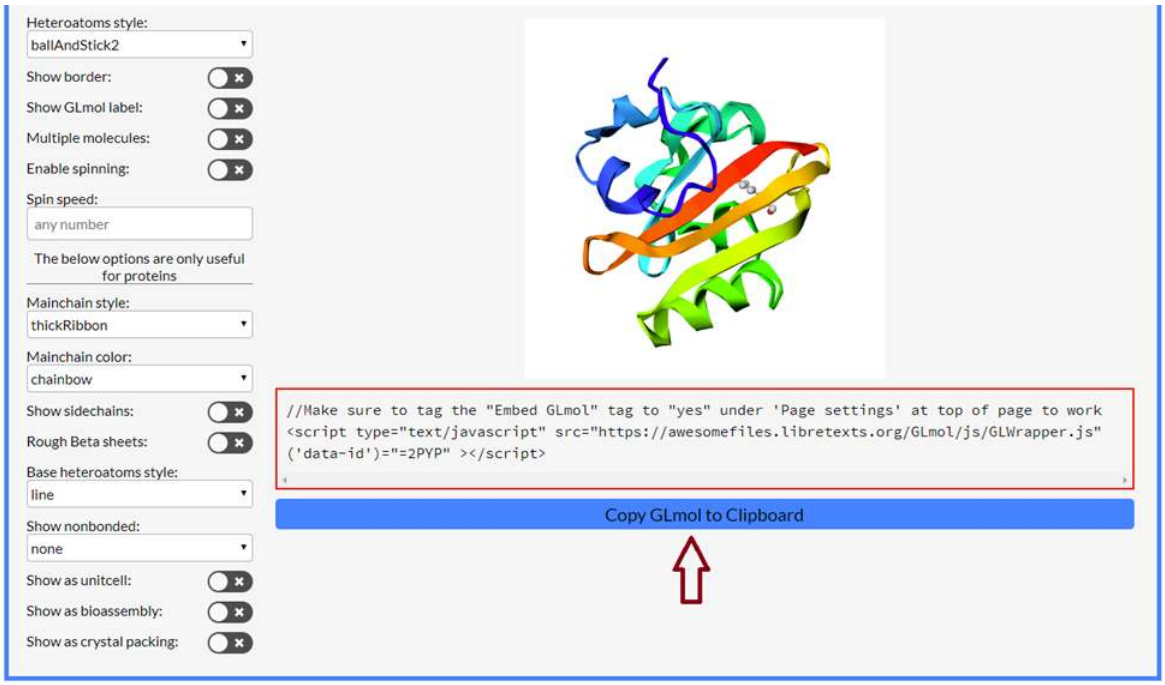
and organize how you want the image to go. Since you will probably want proteins most, select "www.rcsb.org PDB ID" under the option (see red arrow in image below).



Then you put in the PDB code you want. For example "3PYP" for my favorite protein. That pops up the full menu of options including the way the interactive figure will look. Tweak with the options as you like (most are obvious).

Step 2: Copy Code

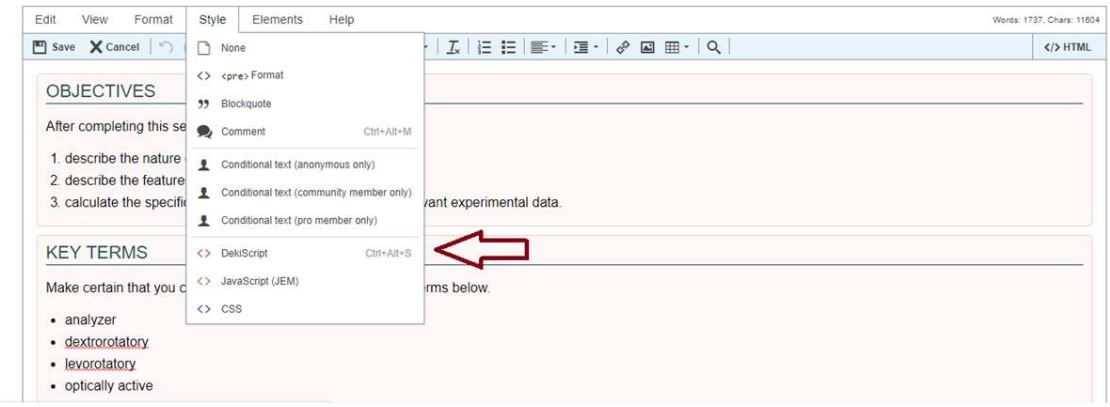
Step 2 (Copy image code): Press the blue button "Copy GLmol to Clipboard" (see red arrow in image below).



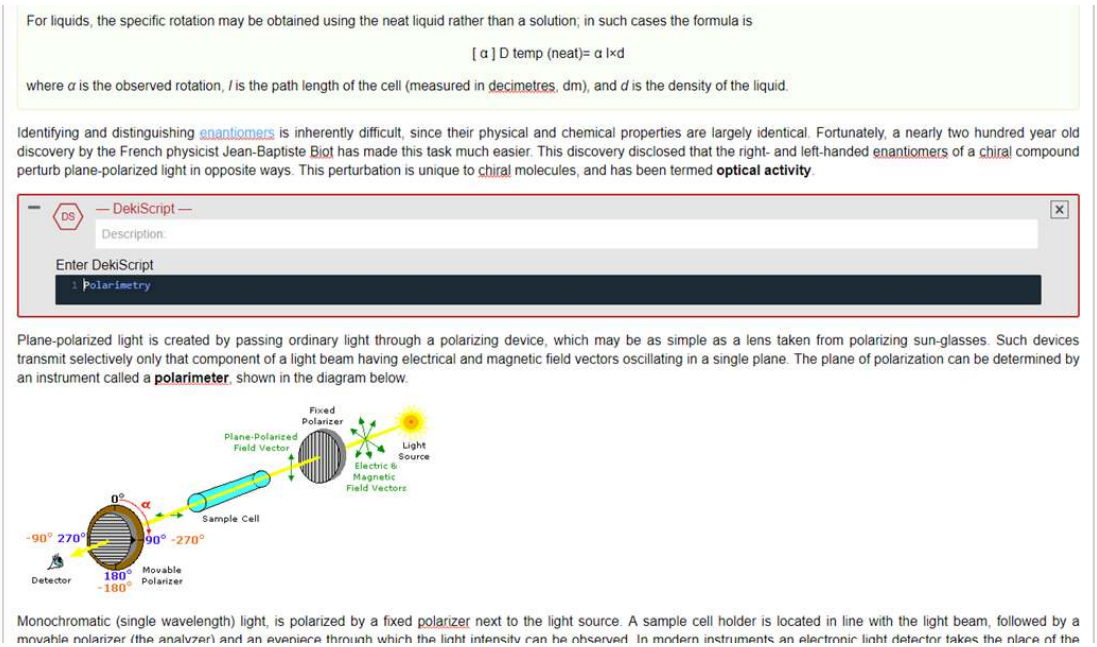
Steps 3 & 4: Navigate, Edit and Prepaste

Step 3 (Navigation and Edit): Go to the LibreTexts page you want to embed that code and "edit" the page.

Step 4 (prepasting): In the spot you want the image to go to "style" and click on "Dekiscript" to add a block to the code.



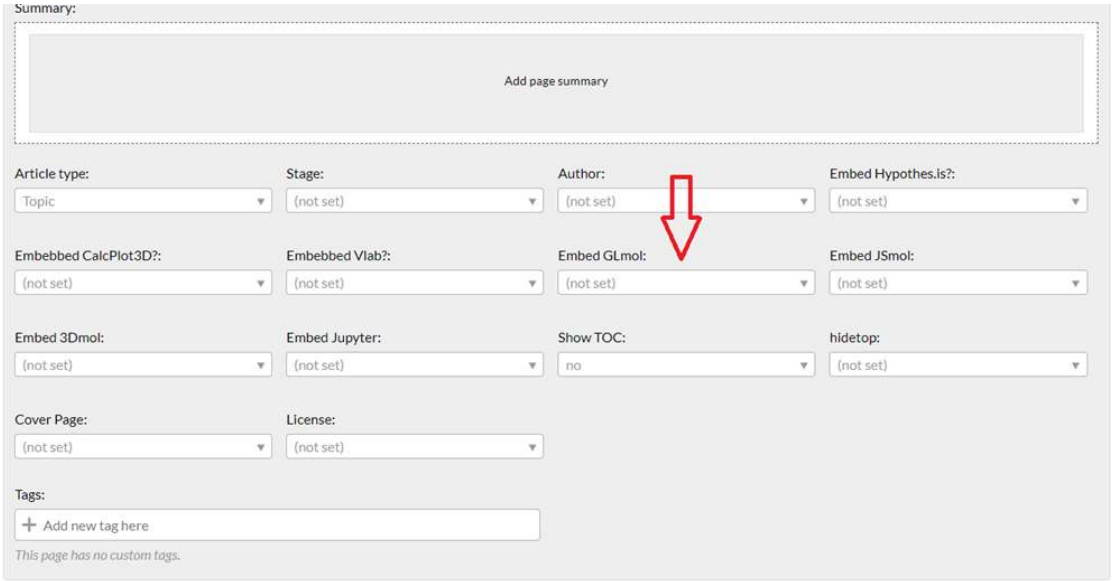
It will look like this:



Steps 5 and 6: Paste and Tag

Step 5 (paste): Paste the code that was saved in step 2 from your clipboard to the red Dekiscript block under "Enter Dekiscript")

Step 6 (save and tag): Save the page, and under page settings (it may be expanded or not) you will see a "Embed GLmol" option (see red arrow below)



The organization of the page settings is not standardized across the libraries; the one above is for chemistry and biology is organized differently, but find the proper tag and switch it to "yes"

Step 7: Refresh

Step 7 (refresh): Refresh the page (e.g., F5 on PCs) and be amazed at the embedded protein in your page.

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5.6: Interactive Molecule and Protein - Reference Options

Template:HideTOC

Data-* Attribute	What it does	Example	GLmol?	3Dmol?	JSmol?
[required] id	Specifies Molecule using the syntax specified in Table2	data- data-	Yes	Yes	Yes
height	Specifies Height	data-height="100" data-height="80%"	Yes	Yes	Yes
width	Specifies Width	data-width="100" data-width="80%"	Yes	Yes	px only
border	Shows colored border	data-border="true"	Yes	Yes	Yes
label	Shows colored label	data-label="true"	Yes	Yes	Shown by default
spin	Specifies if the molecule should spin	data-spin="true"	Yes	Yes	Not Recommended
multiple	Allows multiple molecules in a row	data-multiple="true"	Yes	Yes	Yes
orbital	Specifies an orbital to display using n, l, & m separated by spaces	data-orbital="4 1 1"	NO	NO	Yes
symmetry	When completed will allow JSmol to calculate symmetry of a molecule	[in development]	NO	NO	In Development

Table 2: Data-id reference table

Prefix Character	Postfix	Example	Database
=	PDB ID	=2POR	RCSB PDB
==	RCSB ligand ID	==HEM	RCSB PDB
$	simple molecule name	$caffeine	NCI NIH
$	SMILES	$CC/C=C/CC	NCI NIH
:	Pubchem CID	:1983	Pubchem
:	InCHI	:BSYNRYMUTXBXSQ-UHFFFAOYSA-N	Pubchem

Table 3: GLmol specific data-attributes

Data attribute name	Description	Choices

Data attribute name	Description	Choices
colormode	Sets the coloration of the main chain.	[d] chainbow - makes the chain a rainbow * chain - colors each chain differently * b - colors by B factor * polarity - colors by polar/nonpolar * ss - colors by secondary structure
mainchain	Sets the display style of the main chain	[d] thickRibbon * ribbon * strand * chain * cylinderHelix * tube * bonds * none
sidechains	Sets whether side chains will be visible.	[d] false - will not show sidechains * true - will show sidechains
rough-beta	Sets if beta sheets should be rough (not smoothened).	[d] false - will show smooth beta sheets * true - will show roughened beta sheets
hetatm-mode		[d] ballAndStick2 * stick * line * icosahedron * sphere * ballAndStick
base-hetatm-mode	Sets the display style of Nucleic acid bases	[d] line * stick * polygon * none
nonbonded		[d] none * sphere * cross
projectionmode		[d] perspective * orthoscopic
unitcell		[d] false * true
bioassembly		[d] false * true
crystalpacking		[d] false * true
symmetry		[d] false * true
speed	Set rotation speed	[d] 5 * integer

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5.7: Adding H5P (formative) Activities

LibreTexts content can be enhanced with interactive H5P technology (https://h5p.org/). On this page we will discuss how this technology operates formatively (i.e., without a gradebook) within the LibreTexts platform. LibreText Adapt can be used to make H5P problems into summative activities. The H5P activities are stored on a dedicated Wordpress server, not on the Library servers. Embedding an activity into a LibreTexts page is a three-step process:

Step 1: Create or locate the activity

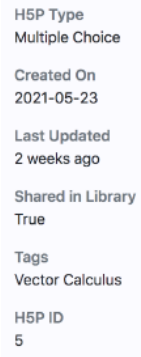
Browse the LibreStudio server (https://studio.libretexts.org) to see if there may already be an H5P activity that you can use. If your credentials do not allow logging into the server, consult the LibreTexts development team for access (info@libretexts.org).

You can also upload the desired activity into the H5P LibreStudio server. There are many public domain H5P activities on the H5P project server and elsewhere that you may find useful and want to import into LibreStudio to use in a LibreText.

And in the likely event you cannot find a problem that does exactly what you have in mind, you can create your own problem in LibreStudio! See the H5P project site (https://h5p.org/) for full instructions on this process, and look at example problems to get ideas.

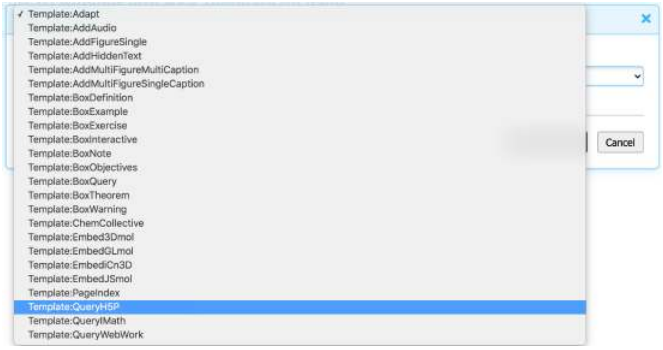
Step 2: Copy the ID Number of the desired activity

Once you have created an H5P activity, look for the H5P ID number. Click on the activity and the following information should be displayed on the right. Note the H5P ID at the bottom of this list.

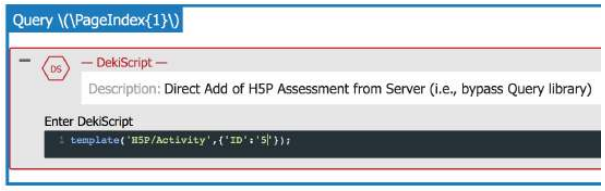


Step 3: Insert ID Number into H5P Template on page

The H5P template lets authors embed the H5P activity into a page (page > elements > template).



Once the template is added to the page, all you have to do is change the ID number of the activity here to the one you located in Step 2 (in the place of 5 in below template).



Save the page. An example activity is below:

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5.8: H5P

H5P is a free and open-source content collaboration framework based on JavaScript. H5P is an abbreviation for HTML5 and aims to make it easy for everyone to create, share and reuse interactive HTML5 content.

The H5P infrastructure on the LibreTexts is part of the greater ADAPT online assessment system that includes other online assessment technologies like WeBWorK and IMathAS (technology behind MyOpenMath).

The WebWork component is functioning independently of the greater QUERY system (e.g., https://webwork.libretexts.org/webwork2) and is available to campuses currently. Existing courses that use the system operate with the online assessment as summative (with grade/gradebook). However, the H5P system on the LibreTexts provides only formative assessments, i.e., ungraded exercises. The plan is for this to switch to summative by summer of 2020.

Spanish H5P depot

Nancy Ballesteros (College of the Canyons), Alejandro Lee (Santa Monica College), and Cristina Moon (Chabot) built a Spanish H5P database for their intermediate/advanced Spanish text: https://human.libretexts.org/Bookshelves/Visualizations_and_Simulations/H5P_Library/Intermediate%2F%2FAdvanced_Spanish_H5P_Library



Video 5.8.1: As part of the LibreTexts presentations for OpenEd Week 2020, Nancy Ballesteros (College of the Canyons), Alejandro Lee (Santa Monica College), and Cristina Moon (Chabot) share their experiences using the LibreTexts platform to build an intermediate Spanish language text with an accompanied H5P interactive assessment library.

Account Needed

To create and store H5P problems, you will need a dedicated account (contact info@libretexts.org to request one); LibreTexts instructor or developer accounts are unable create or upload H5P problems. However, all users can insert existing H5P problems into their pages.

Adding Problems

Once an account is constructed, you can log into the H5P server (currently a WordPress server) at https://h5p.libretexts.org/wp-login.php. After logging in, click on the "H5P Content" at the bottom of the left side bar (see below).

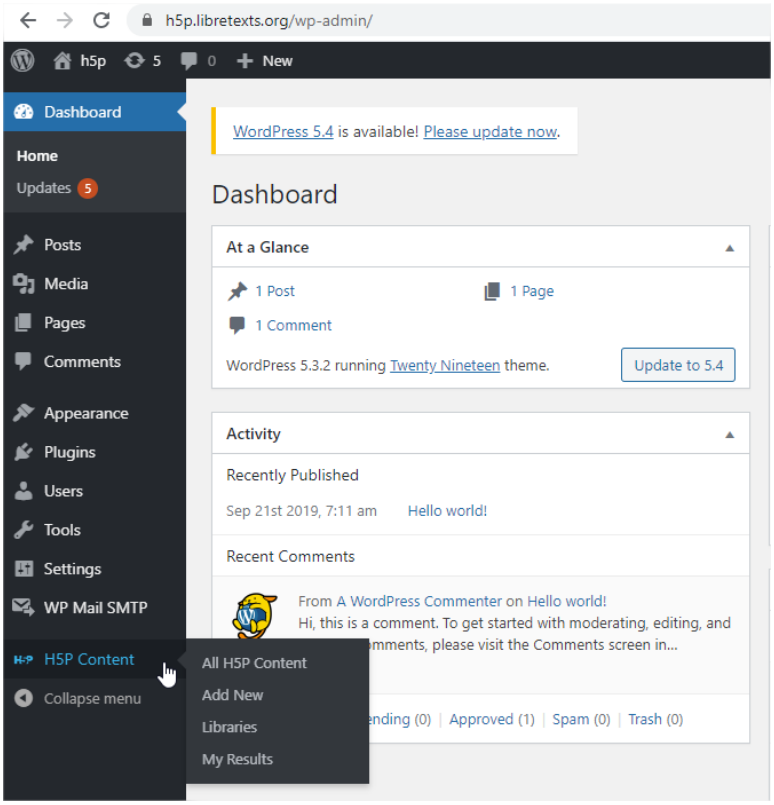


Figure 5.8.2: Select H5P Content. Do not edit anything else.

You can click on "All H5P Content" to pursue the existing exercises or you can click on "Add New" to add a new exercise.

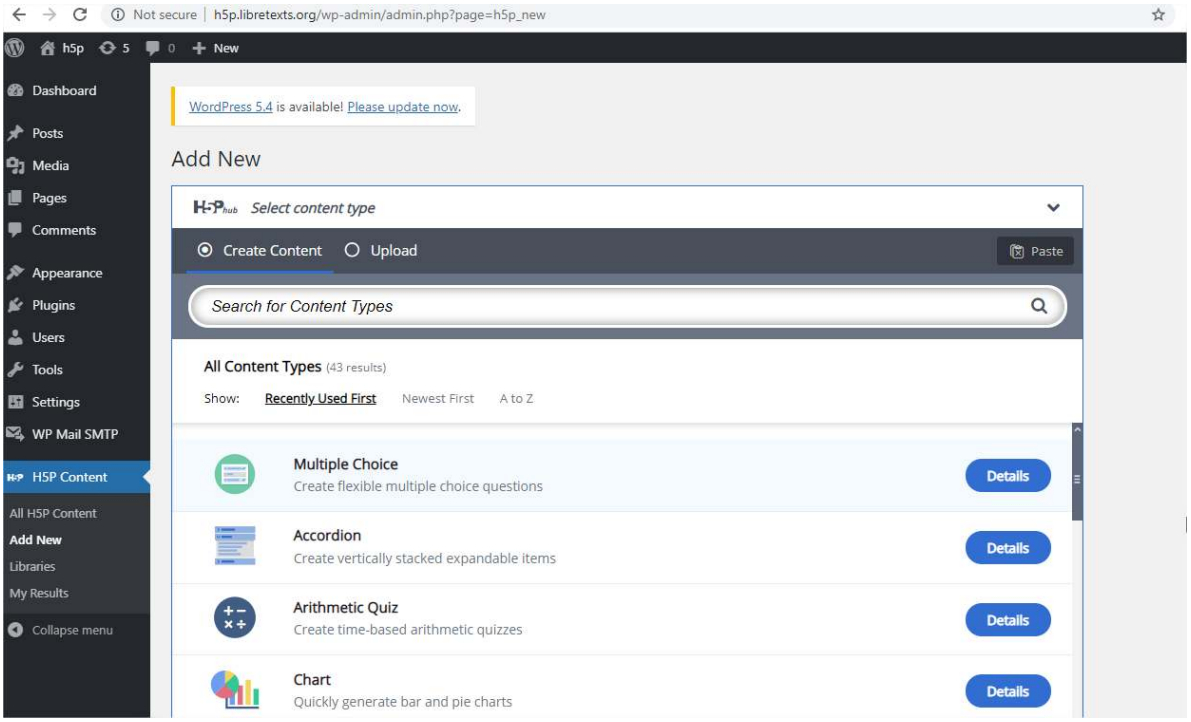


Figure 5.8.3: Adding new H5P exercise.

There are a range of different exercise types that you can select from and you can review the H5P server (https://h5p.org/ and https://h5p.org/content-types-and-applications) for examples of them. Many other sites on the internet also provide similar examples.

Once a problem is created, it is assigned a ID # (Figure 5.8.4).

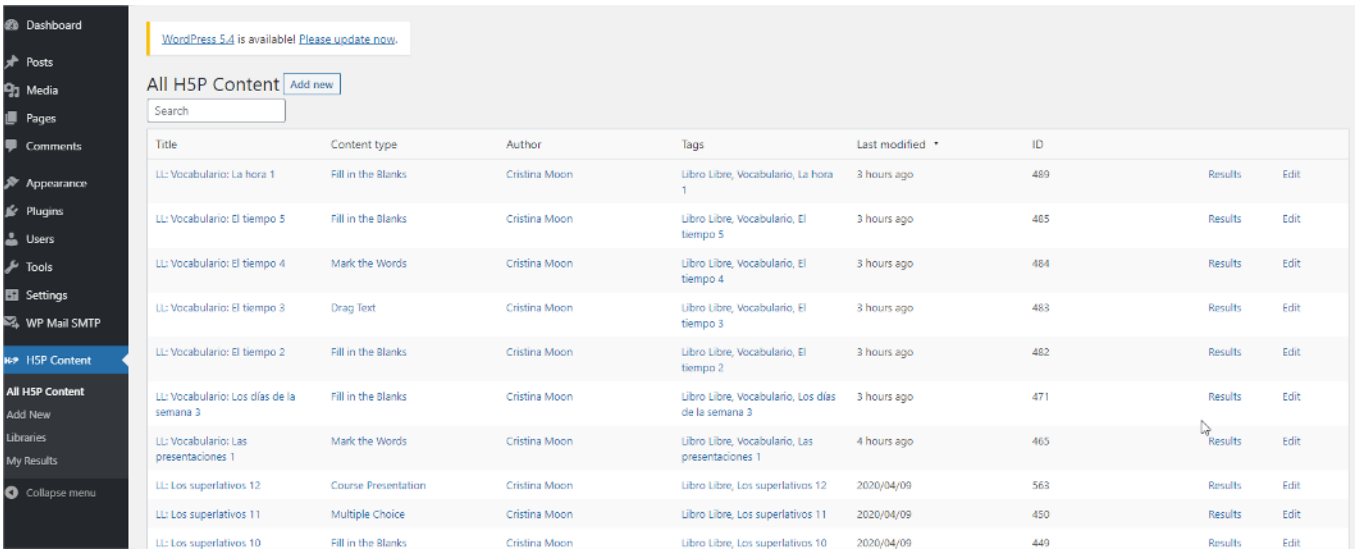


Figure 5.8.4: Existing assessments on the H5P server

Adding to a LibreTexts Page

Problems are added to any LibreTexts page based off of the ID# only. For example, Cristina Moon's exercise ID#127 is embedded in a page on the Humanities library: https://human.libretexts.org/Bookshelves/Visualizations_and_Simulations/H5P_Library/Intermediate%2F%2FAdvanced_Spanish_H5P_Library/Pluscuamperfecto_del_indicativo_actividad_3%3A_fill_in_the_blanks (Figure 5.8.5).



Figure 5.8.5: H5P assessment that is embedded in a LibreTexts page in viewing mode

The underlying code that embedded this is simple one line code.

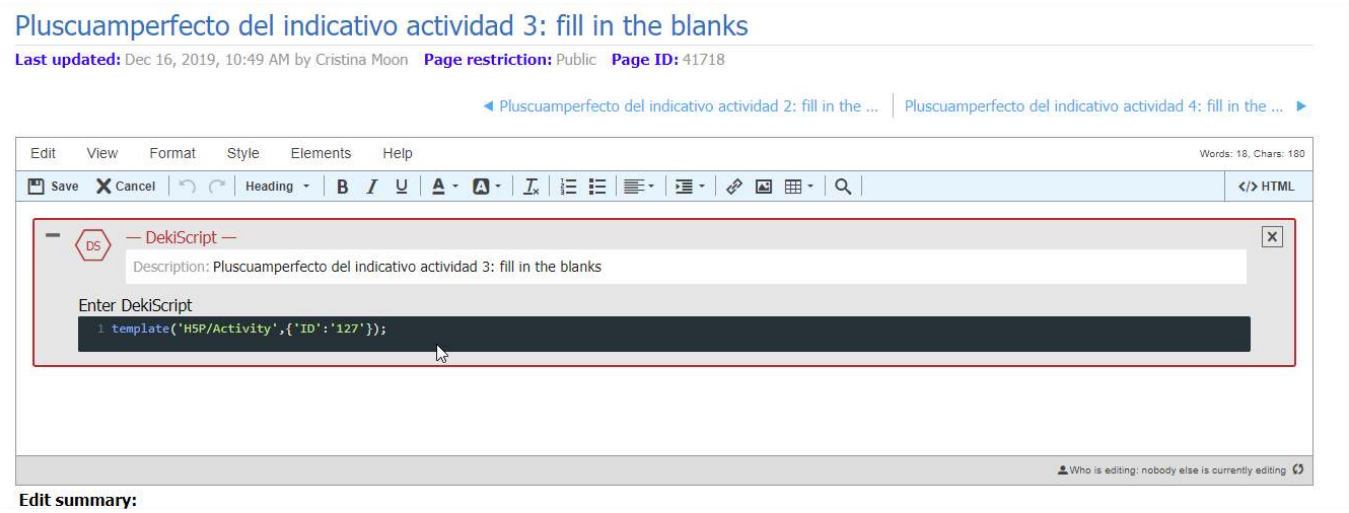


Figure 5.8.6: H5P assessment that is embedded in a LibreTexts page in edit mode

This code is available on all LibreTexts libraries via the "Templates" option under the "Elements" menu (Figure 5.8.7).

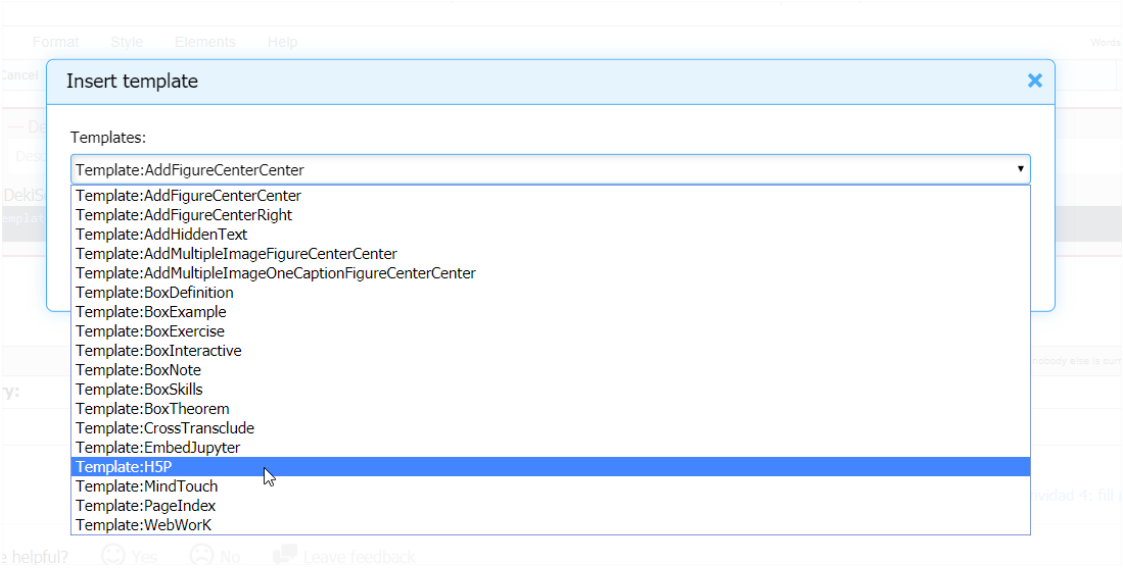


Figure 5.8.7: H5P Embedding code is available via the Template menu.

After inserting the code, all you need to do is manually edit the code to the ID of the exercise you desire (e.g., add your ID# in lieu of "127" in Figure 5.8.6).

Perusing the QUERY Gallery

under construction

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5.9: Creating Dynamic Figures with CalcPlot3D

Overview

CalcPlot3D is a free online visualization tool originally developed to help students learn concepts in multivariable calculus, but now offering visual tools that can be useful in many STEM courses. Using CalcPlot3D, authors of LibreTexts can create and insert dynamic figures of two basic types:

1. Rotatable 3D dynamic plots with no external controls
2. 2D and 3D dynamic plots with scrollbars and some other controls

See examples in Figures 5.9.1 - 5.9.3 below.

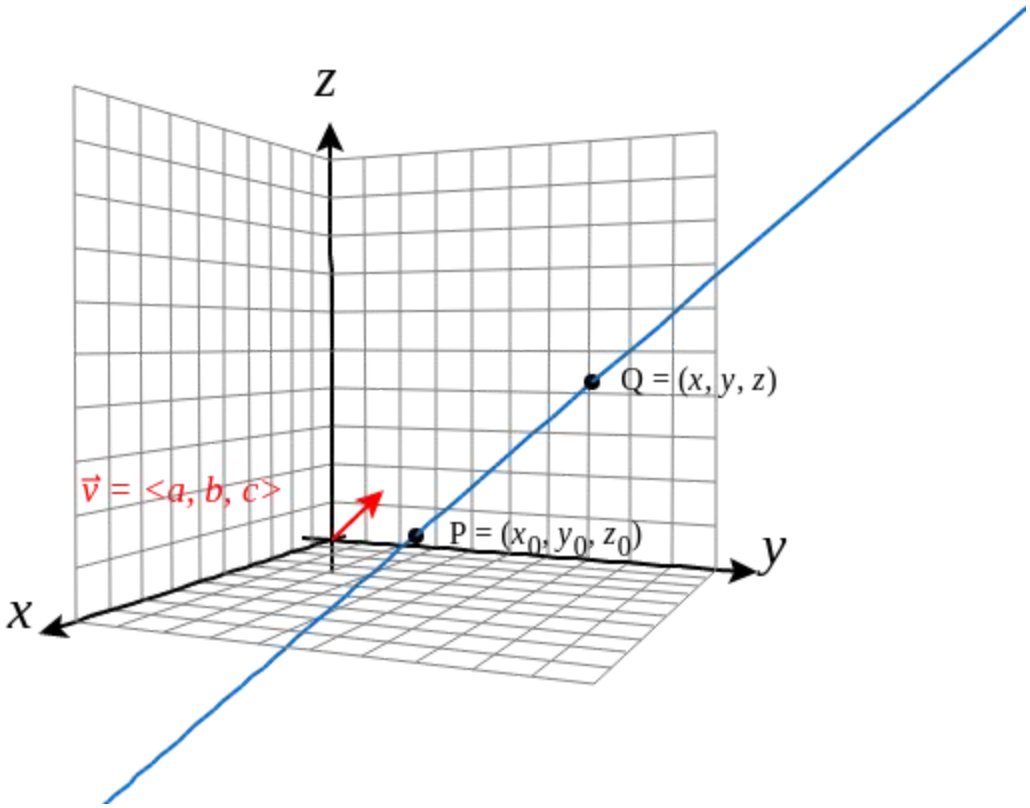


Figure 5.9.1: A three-dimensional line in space (no controls)

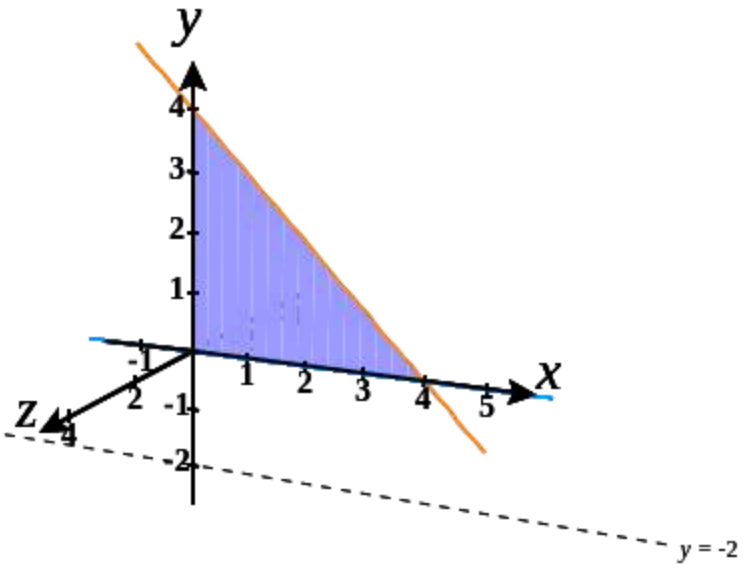


Figure 5.9.2 A demonstration showing the generation of a volume of revolution (includes controls)

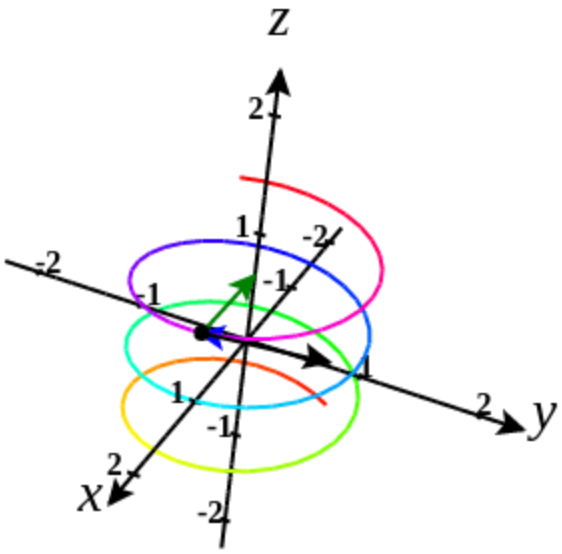


Figure 5.9.3 Animating motion along a helix (includes controls)

As you can see in these examples, both types of dynamic figures can be helpful. Sometimes a rotatable 3D plot is all that is needed. But in other situations, adjusting various parameters with scrollbars, textboxes, and checkboxes can greatly aid student understanding.

Inserting Pre-made CalcPlot3D Dynamic Figures from the Learning Objects Library

This is the easiest way to get started using CalcPlot3D dynamic figures, since it only requires you to browse the Learning Objects library, find a dynamic figure you'd like to use, and then to use the **Content reuse** option on the **Elements** menu to insert it into your LibreTexts page. But this approach does not allow you to adjust the parameters of the interactive figures. You get exactly what's there already. So you may wish to continue to creating your own dynamic figures using CalcPlot3D.

Steps to inserting an existing CalcPlot3D dynamic figure into a LibreTexts page:

1. Browse the **CalcPlot3D Interactives library** (this link is for the one on the LibreTexts Math Library) and find a dynamic figure you'd like to use in your custom page.
2. Select **Elements > Content reuse** from the edit menu. Then click the + in front of **Home**. You should now see the **Learning Objects** library. Click on the + in front of **Learning Objects** and navaigate to find the dynamic figure you found in the previous step.

You should get an object that looks like the following:

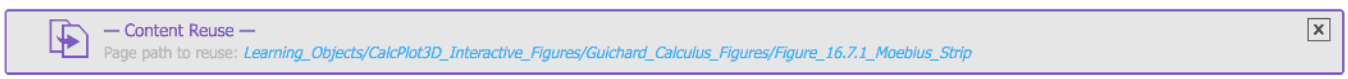
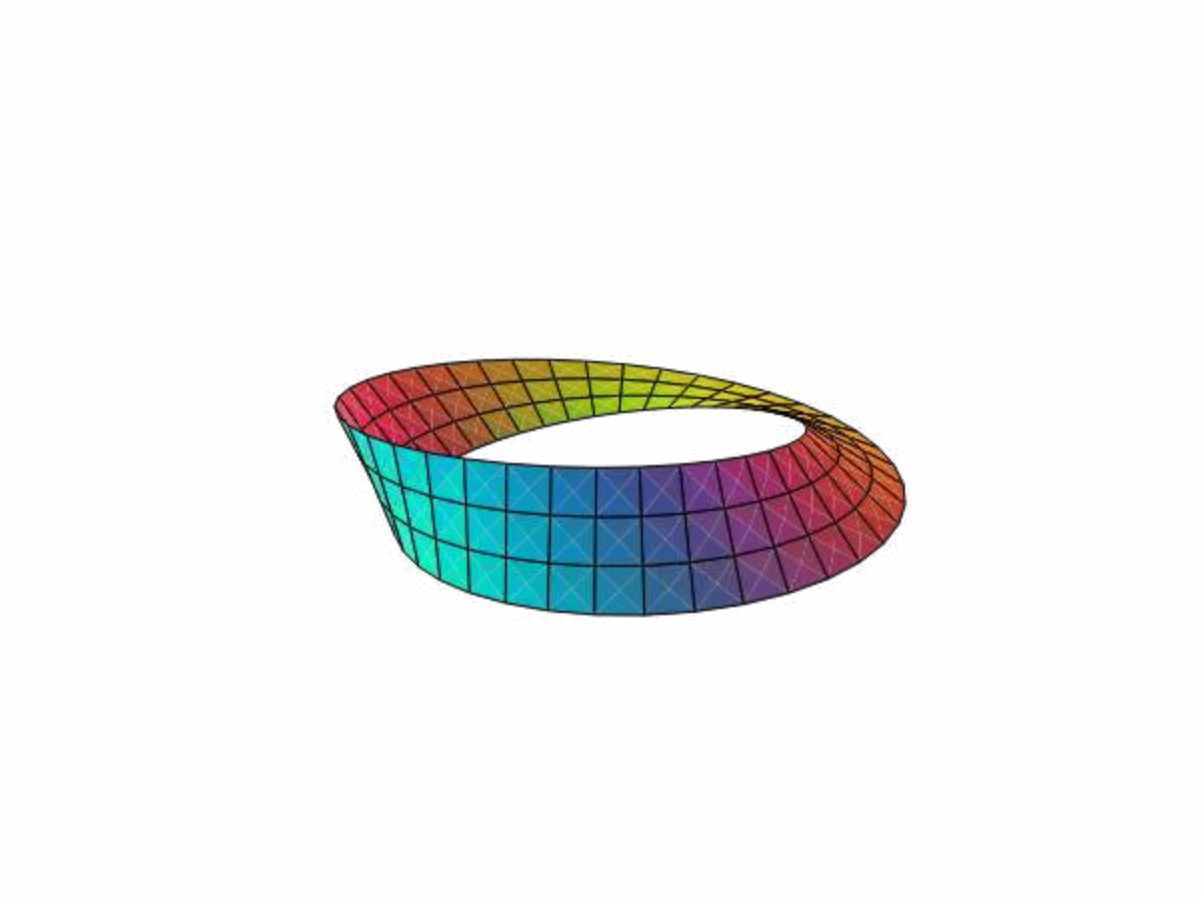


Figure 5.9.4 Content reuse placeholder for a CalcPlot3D dynamic figure when in Edit mode

And renders as:



If you would like to place a CalcPlot3D dynamic figure from the Learning Objects library in a figure, there is a template for that.

Select **Elements** > **Templates** and choose **Template:AddFigureCalcPlot3DReuse** (available on the LibreTexts Math Library). It will generate the following placeholder:

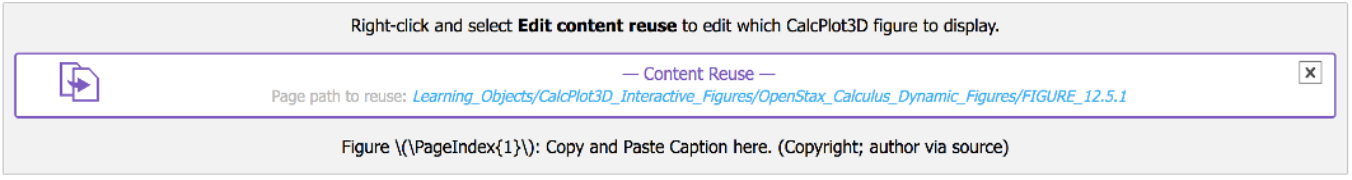


Figure 5.9.5 Template:AddFigureCalcPlot3DReuse placeholder with instructions to edit figure.

You can then follow the instructions at the top of the placeholder to right-click on the content reuse object, select **Edit content reuse**, and adjust the selection to the CalcPlot3D dynamic figure you want to use. Update the figure caption and remove the instructional text at the top of the figure and you'll be all set!

See examples in the **Overview** section at the top of this page.

Inserting Pre-made CalcPlot3D Figures from a Different LibreTexts Library

If you decide you'd like to insert a CalcPlot3D dynamic figure from a LibreTexts library other than the one in which you are building your custom text, this can be accomplished using a Cross-Library Reference, the library subject area, and the Page ID number for the CalcPlot3D dynamic figure you have selected.

Say we wish to insert the following figure from the LibreTexts Math Library on a page in another LibreTexts library (say Chemistry or Physics).

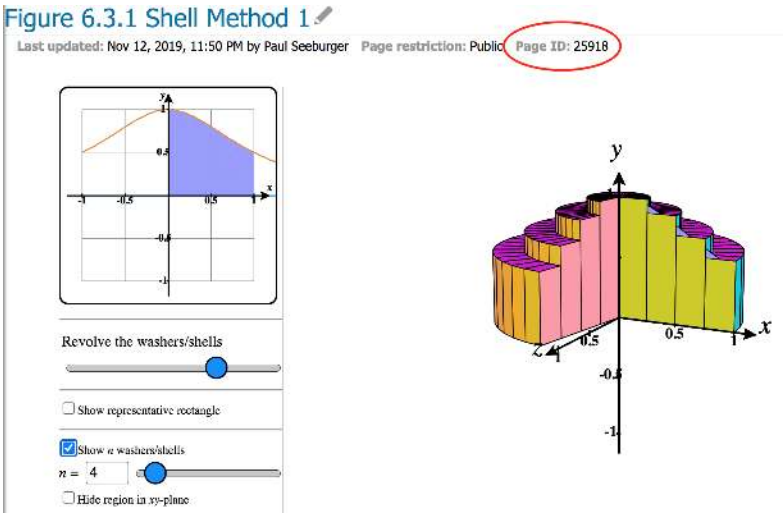


Figure 5.9.6 Static image of a CalcPlot3D dynamic figure from the LibreTexts Math Library, with its Page ID circled in red.

We would need to create a new page, name it, and then save it (before editing it) to set it up with the correct codes. Then we would edit the page again and click on the </> HTML button on the right end of the editing toolbar. Enter the following code.

```
<p class="mt-script-comment">Cross Library Transclusion</p>

<pre class="script">
template('CrossTransclude/Web',{'Library':'math','PageID':25918});</pre>
```

Saving your page should reveal the CalcPlot3D dynamic figure you wanted. This code could also be placed inside a LibreTexts page with other text and figures, or you could set up a collection of figures each in their own page that you could easily place in other pages using the Content Reuse approach described above.

Note

This Cross Library Transclusion code can be used to insert any content from another library into your custom LibreTexts.

Creating your own CalcPlot3D Dynamic Figures using CalcPlot3D (without controls)

In this section, we'll discuss how to generate your own CalcPlot3D dynamic figures using the CalcPlot3D app. As stated above, there are two types, a basic rotatable 3D plot with no controls, and a 2D or 3D plot with controls. Since the first type is easiest to implement, we'll start there and then cover the second variety in the section titled Creating your own Dynamic Figures using CalcPlot3D (with controls) below.

1. Open **CalcPlot3D** and work out the figure you wish to include in your LibreTexts page. See the CalcPlot3D Help Manual for assistance with this.
2. Once you have the 3D plot as you want it to appear in the dynamic figure (including the initial orientation), click on the menu icon (☰) in the upper-left corner of the app, select **File** and then **Encode View in URL**. See Figure 5.9.7 below.

   The page will reload with the new URL that will include a script that specifies the initial view. It should match the view you had set up in step 1.
3. Copy the entire query string following the question mark in the URL to the system clipboard. Ctrl-c (cmd-c on a Mac) will help you do this.
4. Use this query string to paste into the HTML code shown below in either the section titled Creating Sharable CalcPlot3D Interactives in LibreTexts or the section titled Using Template:AddFigureCalcPlot3DNew to Insert your New

CalcPlot3D Dynamic Figures (without controls). Note that the second approach is easier for beginners, but there are some advantages to organizing your CalcPlot3D dynamic figures in a repository folder (see the next section).

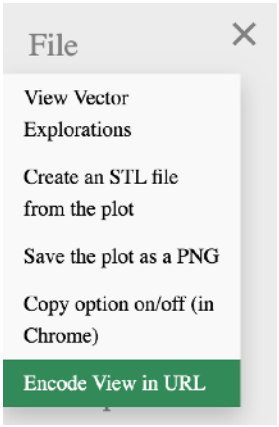


Figure 5.9.7: Use the **Encode View in URL** option on the **File** menu in CalcPlot3D to create the query string you will need here.

Creating Sharable CalcPlot3D Interactive Figures in LibreTexts

There is at least one advantage to creating standalone CalcPlot3D dynamic figure pages in your own repository folder (a "Book" in your Campus Hub or Sandbox). It makes your interactive figures much easier to share with others. All they need to do is follow the instructions above to use content reuse to insert your figures into their pages.

It also allows you to easily update the code for all your figures in one place. And if you happen to want a particular figure in multiple places in your LibreTexts, it's a great way to use transclusion to minimize the code you have to maintain moving forward.

This was the approach used to create the library of CalcPlot3D Interactive Figures in the **Learning Objects** library.

Since the typical user does not have permissions to add new objects there, we will cover how you can create your own repository of CalcPlot3D Interactive Figures. Initially you may practice this process in your Sandbox, but eventually you'll want to move your repository to your Campus Hub, once you have access to it. Note that all links should update when you decide to move this folder. You may wish to make the folder containing these files semi-private using the Permissions menu option on the Options menu for the folder.

The first step in this process is to get a copy of one of the existing CalcPlot3D figures (without controls) into this folder. You have two options to do this for the first time.

1. You can use the Remixer, possibly even using it to create the new "book" which will serve as a repository for your personally created CalcPlot3D dynamic figures, or
2. You can create a new Book in your Sandbox (or Campus Hub), naming it CalcPlot3D Repository (or similar), and then create a new page in this book. Then use **Elements > Content reuse** to import an existing CalcPlot3D figure into that page. Bee sure there is nothing else in the page.

Once you have a transcluded copy of a CalcPlot3D figure, you will need to fork the page using the Forker option on the Options menu for the page (or the fork symbol to the right of the page title, if you used the Remixer). This should give you a full copy of a CalcPlot3D dynamic figure of your own to edit.

Once you have used either of these approaches, you should have a linked/transcluded copy of a CalcPlot3D dynamic figure in your repository folder. To create additional CalcPlot3D figures, you can just copy this one, giving it a new name!

From this new forked page, click the **Edit** button on the login bar. Note that the CalcPlot3D figure will still appear in rendered form in Visual edit mode. Click the </> **HTML** button in the upper-right corner of the edit window to change to HTML mode.

Replace the code shown highlighted in blue in Figure 5.9.8 with the query string you formed in Step 3 in the previous section. Note that depending on the figure you chose for this placeholder, the code may be longer or shorter than what is shown in this figure.

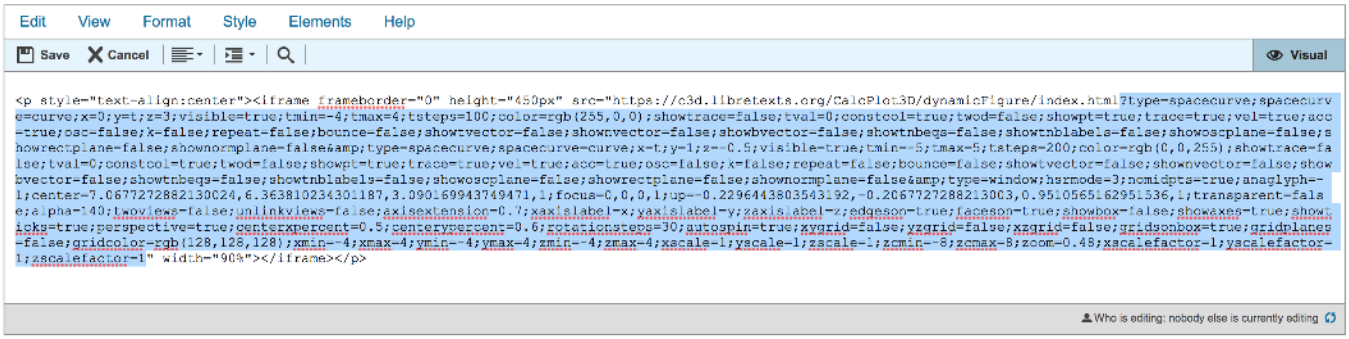


Figure 5.9.8 Highlighted query string code that needs to be replaced when you create a new CalcPlot3D dynamic figure using CalcPlot3D

Clicking of the **Visual** button to toggle back to view the WYSIWYG mode of the editor will actually let you see how the CalcPlot3D figure looks before you save it. If you need to adjust anything in the code, you can switch back to adjust it using the </> **HTML** button again. One of the most common options that you may wish to adjust is the zoom option, located about 4 script commands from the end of the query string. Decreasing the decimal number will make the 3D plot smaller. Increasing it will make the 3D plot larger.

You can actually adjust any of the options in the string, many of which are fairly intuitive. But these could also be adjusted using CalcPlot3D and updating the URL query string.

Note that when you create CalcPlot3D figures with this approach, it is very helpful to add a static image of the figure to the page holding the code for it. This makes the figures much easier to quickly browse in your repository, although it takes an extra step on your part.

Adding a Static Image to your Sharable CalcPlot3D Figure

Once the figure looks as you want it to look, take a screen snip of the figure using a tool like Snip & Sketch on Windows (or Shift-Cmd-4) to create and save an static image to serve as the thumbnail for this figure. Then open the **Page Settings** at the top of the page by clicking anywhere on this gray bar.

If the **Article Type** is not **Book or Unit** or **Chapter**, change it to one of these. This will allow the Thumbnail option to be shown. Once you have changed the **Article Type**, reload the page.

Next hover over the thumbnail image (it may be blank) in the upper-left corner and click on the pencil you should see there. This should allow you to load your saved thumbnail image and you will be all set!

Inserting your own CalcPlot3D Dynamic Figures in LibreTexts Pages

Next we will want to insert our new dynamic figure into a LibreTexts page. There are two basic ways to do this. We can either use **Content reuse** or the template, **Template:AddFigureCalcPlot3DReuse** to insert the new sharable CalcPlot3D Interactive figure we created above or we can use the template, **Template:AddFigureCalcPlot3DNew**, to hard-code the script for our new CalcPlot3D dynamic figure into the page.

Using Content Reuse or **Template:AddFigureCalcPlot3DReuse** to Insert your Sharable CalcPlot3D Dynamic Figures

If you have chosen to create sharable interactive elements for your CalcPlot3D figures, you can use **Elements > Content reuse** or the template, **Template:AddFigureCalcPlot3DReuse** to add them into your LibreTexts page, depending on whether you want them in a figure object or not. See the section above titled, Inserting Pre-made CalcPlot3D Dynamic Figures from the Learning Objects Library for instructions for how to do this. The only difference here is where you will look for the CalcPlot3D dynamic figure you wish to reuse. Rather than looking in the Learning Objects library, you'll look in your own Interactive Figure repository in your Campus Hub (or Sandbox, if you are practicing).

Using Template:AddFigureCalcPlot3DNew to Insert your New CalcPlot3D Dynamic Figures (without controls)

We can also add a CalcPlot3D dynamic figure using the new template, **Template:AddFigureCalcPlot3DNew**. This template includes the actual HTML code for the CalcPlot3D object so that you can modify the parameters yourself or copy-and-paste the query string from the CalcPlot3D-generated URL into the provided HTML code. Once you have updated the code, you'll also want to remove the instructions given at the top of the figure.

When you insert the template, you will see the following:

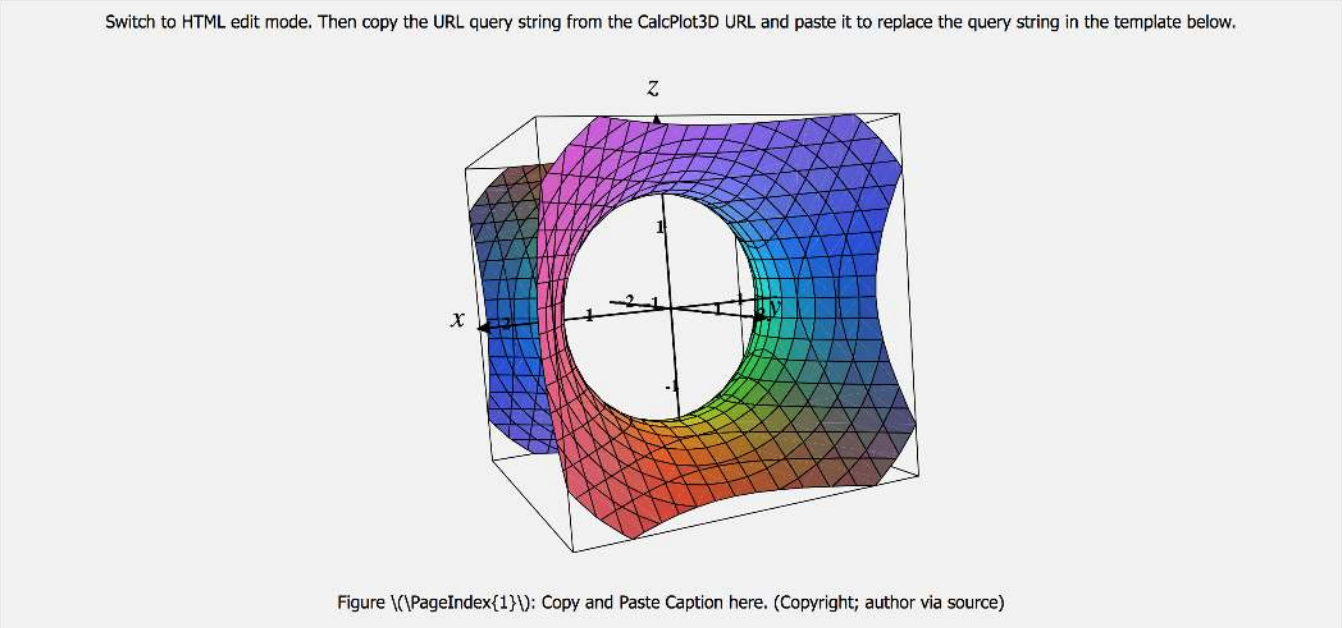


Figure 5.9.9 The appearance of the template **Template:AddFigureCalcPlot3DNew** when it is first inserted

To adjust the actual plot shown, you will switch to HTML edit mode using the button in the upper-right corner of the edit window labeled </> **HTML**. Then you will copy the query string in the URL generated by CalcPlot3D, as described above (everything after the ?) and paste it into the template code, replacing just the query string starting with ? and ending with "zscalefactor=1". See the highlighted portion of the code in Figure 5.9.10 below.

```
<figure>
<div style="width:100%">
<p style="text-align:center"><iframe frameborder="0" height="480px" src="https://c3d.libretexts.org/CalcPlot3D/dynamicFigure/index.html?type=implicit;equation=x^
2-y^2+z^2-2;cubes=16;visible=true;fixdomain=false;xmin=-2;xmax=2;ymin=-2;ymax=2;zmin=-2;zmax=2;alpha=-1;view=0;format=normal;constcol=rgb(255,0,0)&amp;type=windo
w;harmode=3;nomidpts=true;anaglyph=-1;center=3.8405533595127737,9.201727028826916,0.7605061339184678,1;focus=0,0,0,1;up=-0.13827250014695583,-0.1369532655300057
8,0.9808794618931411,1;transparent=false;alpha=140;twoviews=false;unlinkviews=false;axisextension=0.7;xaxislabel=x;yaxislabel=y;zaxislabel=z;edgeson=true;faceson=
true;showbox=true;showaxes=true;showticks=true;perspective=true;centerxpercent=0.5;centerypercent=0.5;rotationsteps=30;autospin=true;xygrid=false;yzgrid=false;xz
grid=false;gridsonbox=true;gridplanes=false;gridcolor=rgb(128,128,128);xmin=-2;xmax=2;ymin=-2;ymax=2;zmin=-2;zmax=2;xscale=1;yscale=1;zscale=1;zmin=-4;zmax=4;z
oom=0.75;xscalefactor=1;yscalefactor=1;zscalefactor=1" width="90%"></iframe></p>
</div>

<figcaption>Figure \(\PageIndex{7}\): The default CalcPlot3D&amp;nbsp;plot in this template</figcaption>
</figure>
```

Figure 5.9.10 Replace just the query string shown highlighted in the HTML code above.

One advantage of this method of inserting your CalcPlot3D dynamic figures is that you can see how they look in the Visual mode as you edit the page.

Rendering the default figure (with the instructions line removed):

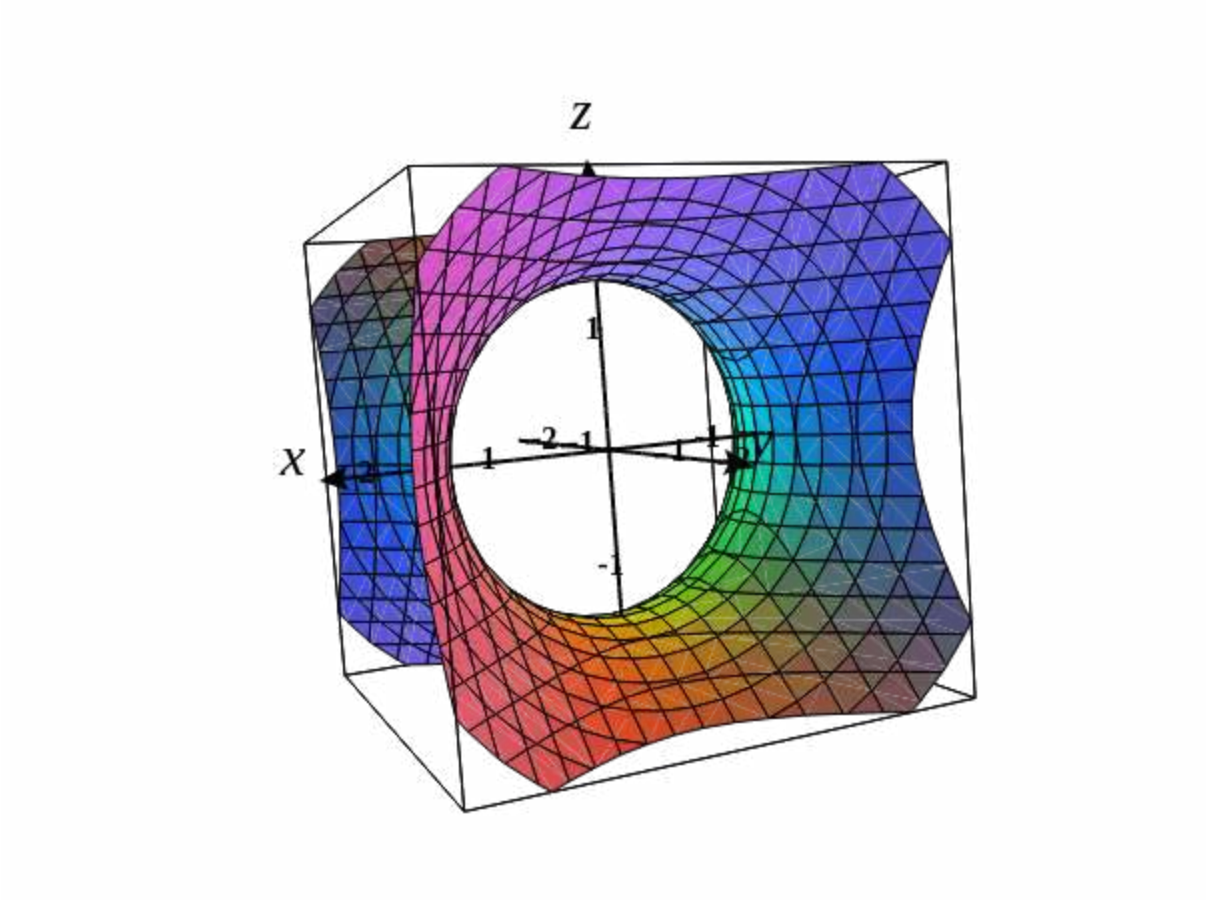


Figure 5.9.11: The default CalcPlot3D plot in this template

Creating your own CalcPlot3D Dynamic Figures using CalcPlot3D (with controls)

Several types of plots in CalcPlot3D can be used to generate dynamic figures that include scrollbars, textboxes or other controls that meaningfully control aspects of the figure.

These are (so far):

1. Any plot that uses parameter sliders
2. Any space (or plane) curve plot can include sliders and an animate button (as shown in Figure 5.9.3 above).
3. Any volume of revolution figure can include a whole set of controls (as shown in Figure 5.9.2 above).
4. The trace plane can be shown along with the rotatable 3D plot when contours are shown in the 3D plot, allowing an input point in the trace plane to be moved around while displaying the corresponding output point on the surface. (See Figure 5.9.12 below.)

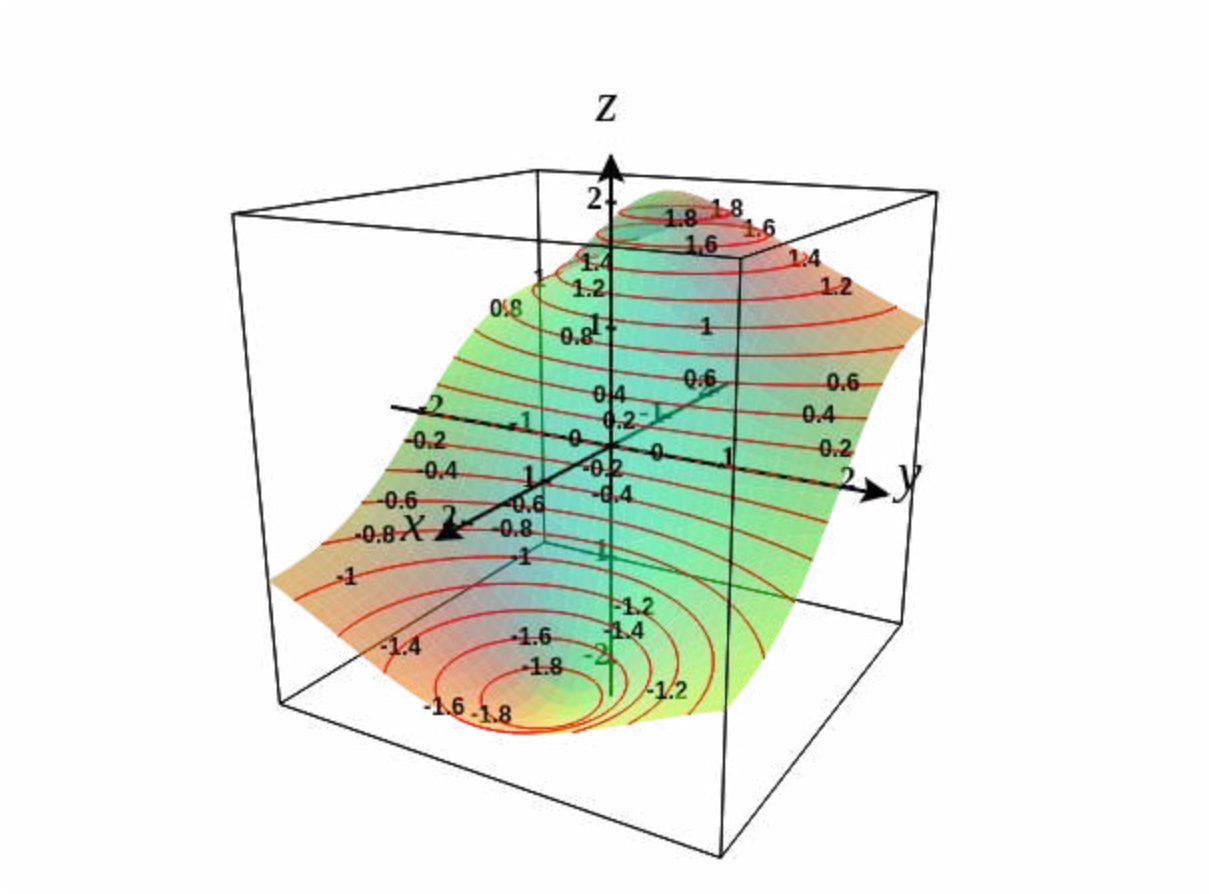


Figure 5.9.12 Example figure showing contour plot and trace plane control.

If you have other situations that you'd like to animate that are not covered here, please send a detailed request of your idea to Paul Seeburger.

Creating the URL Query String in CalcPlot3D for a Dynamic Figure with Controls

To make a CalcPlot3D dynamic figure that includes meaningful controls, it does need to include certain things for this to happen.

If you include parameters and parameter sliders are visible on the control panel when in CalcPlot3D, this plot can be converted into a dynamic figure with controls.

Secondly, as mentioned above, any volume of revolution and any plane curve or space curve can be converted into a dynamic figure with controls.

And finally, if you create a contour plot for a function of two variables and save it to the URL when the main plot window is 3D, but still showing the contours on the surface, then this can be converted into dynamic figure like that shown in Figure 5.9.12 above.

Once you have created your plot in CalcPlot3D, use the process described above in the section titled Creating your own CalcPlot3D Dynamic Figures using CalcPlot3D (without controls). That is, use the **Encode View in URL** option on the **File** menu to obtain the query string for the CalcPlot3D plot. Copy the query string to the clipboard, as described above and then follow the instructions below.

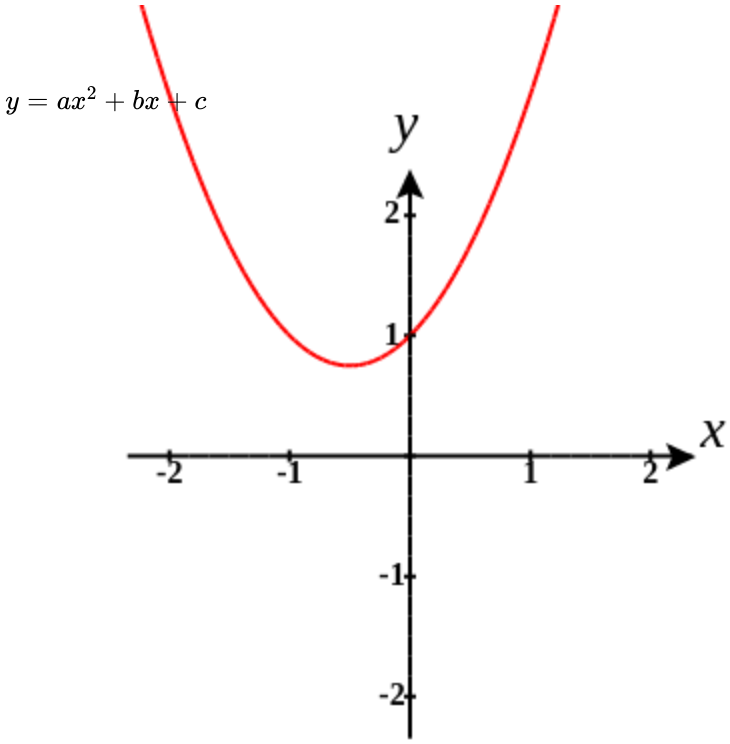


Figure 5.9.13 Example figure showing 2D plot with parameter controls.

Inserting CalcPlot3D Dynamic Figures with Controls in LibreTexts Pages

Creating Sharable CalcPlot3D Dynamic Figures with Controls

First, you will need to either create a copy of a similar CalcPlot3D dynamic figure with controls in your repository folder. If you already have one there, just copy it. If not, copy one from the Learning Objects library, following the steps described in section Creating Sharable CalcPlot3D Interactive Figures in LibreTexts above.

Second, you should check that the figure does indeed use the correct URL to call CalcPlot3D. If it has controls, it should call the following base URL before the query string:

```
https://c3d.libretexts.org/CalcPlot3D/dynamicFigureWCP/index.html
```

Note that the only thing that is different here is that the base URL has the characters 'WCP' after 'dynamicFigure' in its path. The WCP represents, "With Control Panel".

Third, you can paste the query string from your CalcPlot3D plot into this new template that you have made.

This means that in order to add a CalcPlot3D dynamic figure **with controls**, you will either need to copy an existing figure with controls or you will need to modify the HTML base URL by adding these three letters (WCP).

There are a number of special commands you may wish to add to the script in the URL query string to adjust what appears and how it is labeled.

Useful Script Commands for CalcPlot3D Dynamic Figures

For CalcPlot3D dynamic figures with controls there are a few options that you may wish to add to the query string by hand. There are even a few commands listed in the last bullet below that can be used for CalcPlot3D dynamic figures with or without controls.

- You can add a `name` attribute and/or a `noanimate` attribute to any sliders. For example, “noanimate=true;name=n_x”. Note that each object, including the sliders, starts with “type=” in the query string. To clarify, these attributes must be set in the definition of the relevant slider object.

  See:

  ```
  type=slider;slider=a;value=1;steps=2;pmin=1;pmax=3;repeat=true;bounce=true;waittime
  ```

  The `name` attribute changes the label of the slider to the supplied name, using MathJAX to format the supplied name. This means you can use LaTeX in the name.

  The `noanimate` attribute allows you to hide the **Animate** button on the slider control, if you wish.

- For figures showing the trace plane (currently those with contour plots), you can add one or more of the following attributes to the window element at the very end of the query string: “hidexysliders=true; hidetracevalue=true;hidetrancepoint=true;”

  See:

  ```
  type=window;hsrmode=3;anaglyph=-1;center=-7.447051206708178,-2.790794355991455,3.71
  focus=0.5,0.5,0.5,1;up=0.39804763218685024,0.14521777837291014,0.9057979241281567,1
  unlinkviews=false;axisextension=0;xaxislabel=%20;yaxislabel=%20;zaxislabel=%20;edge
  showaxes=false;showticks=false;perspective=true;centerxpercent=0.5;centerypercent=0
  xygrid=false;yzgrid=false;xzgrid=false;gridsonbox=false;gridplanes=true;gridcolor=r
  xmin=0;xmax=1;ymin=0;ymax=1;zmin=0;zmax=1;xscale=1;yscale=1;zscale=1;zcmin=-4;zcmax
  xscalefactor=1;yscalefactor=1;zscalefactor=0.5;
  hidexysliders=true;hidetracevalue=true;hidetracepoint=true;"
  width="90%"></iframe></p>
  ```

  Here the `hidexysliders` tag allows you to hide the x- and y-sliders that appear below the 2D trace plane by default.

  The `hidetracevalue` tag allows you to hide the trace value normally displayed on the 3D plot when moving a trace point around on the 2D trace plane (and 3D surface).

  The `hidetracepoint` tag allows you to hide the trace point that may otherwise be shown when you click on the 2D trace plane that appears here.

- For figures that include volumes of revolution, you may wish to add the `hideaxisofrev` command.

  See:

  ```
  type=window;hsrmode=0;nomidpts=false;anaglyph=-1;center=5,3,10;focus=0,0,0,1;up=0,2
  alpha=140;twoviews=false;unlinkviews=false;axisextension=0.7;xaxislabel=x;yaxislabe
  faceson=true;showbox=false;showaxes=true;showticks=true;perspective=true;centerxper
  centerypercent=0.42;rotationsteps=30;autospin=true;xygrid=false;yzgrid=false;xzgrid
  gridplanes=false;gridcolor=rgb(128,128,128);xmin=-1;xmax=5;ymin=-2;ymax=4;zmin=-4;z
  zscale=2;zcmin=-8;zcmax=8;zoom=0.37;xscalefactor=1;yscalefactor=1;zscalefactor=1;
  rotatestart=0;rotatedirectionx=1;rotatedirectiony=0;hidexysliders=true;hidetraceval
  hidetracepoint=true;hideaxisofrev=false" width="90%">
  ```

- Note the other commands shown here can be used in any CalcPlot3D dynamic figure (with or without controls).

  The `rotatestart` attribute can have values between 0 and 100 and allows you to set an initial rotation speed. The default speed is 0 which will not cause any initial rotation.

  The `rotatedirectionx` and `rotatedirectiony` attributes allows you to specify the initial direction of rotation. Typically these values should be between -1 and 1.

Other commands will likely be created as new features are added to CalcPlot3D to accommodate new types of dynamic figures with controls.

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5.10: Adding Geogebra Explorations to LibreTexts Pages

Adding interactive problems/activities using can make your LibreTexts more interactive and provide immediate feedback to students on their understanding. In addition to interactive problems from H5P, WeBWorK, or MyOpenMath, you can easily also add GeoGebra explorations to your LibreTexts.

Although GeoGebra Explorations are not included as a problem type in Adapt, there are some existing GeoGebra explorations in the LibreTexts Math Library (https://math.libretexts.org/Learning_Objects/GeoGebra_Simulations). It is also fairly easy to find existing GeoGebra explorations addressing many topics using a search engine or searching on the GeoGebra website (https://www.geogebra.org/). If nothing you find demonstrates the concept(s) you have in mind, it's not too hard to learn to create your own GeoGebra explorations using **GeoGebra Classic** on the web.

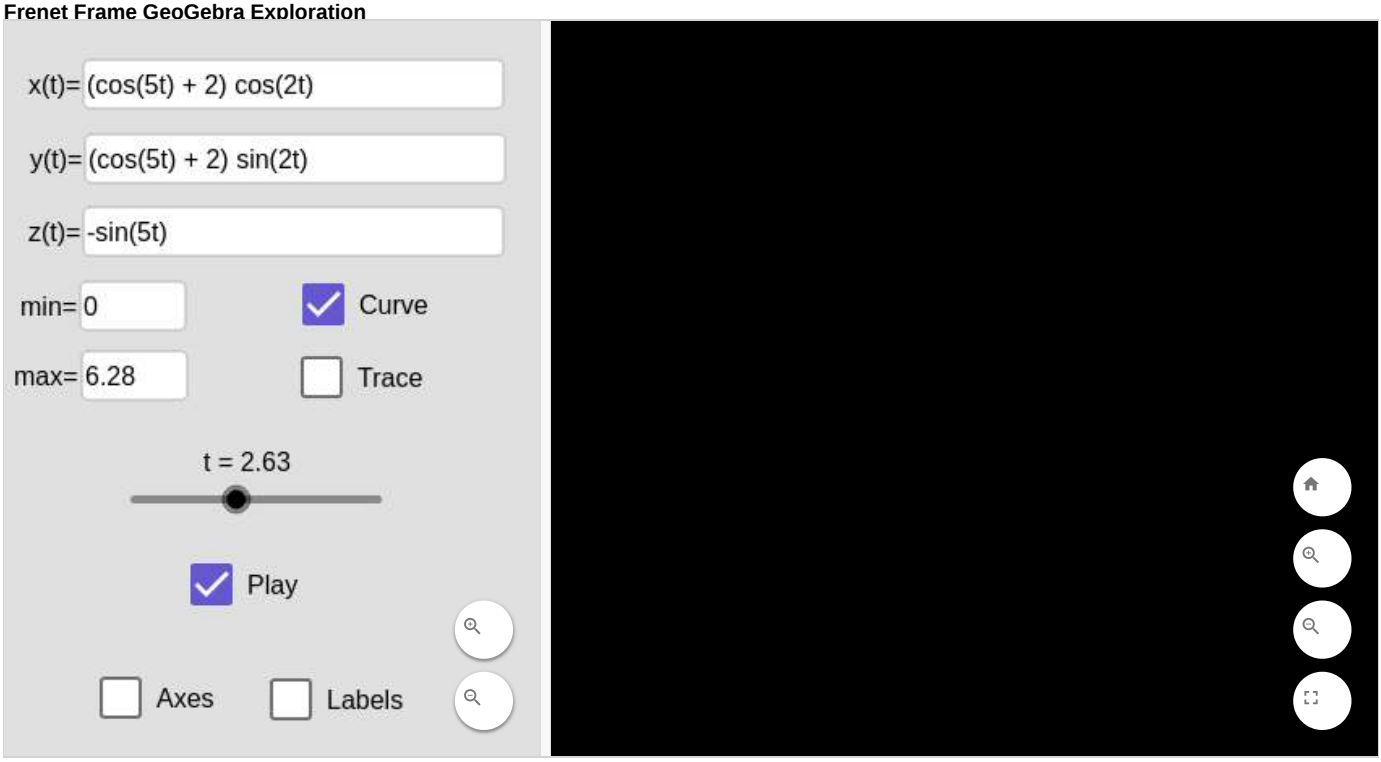
In this tutorial, we will learn how to insert GeoGebra explorations in a Libretexts page. There are several ways to to this. The process you need depends on whether the GeoGebra exploration you want to insert is found in a LibreTexts respository or if you found it (or created it) on the GeoGebra website.

We'll cover how to insert an existing GeoGebra exploration from a LibreTexts repository first and then cover how to insert any GeoGebra exploration you find or create online.

Inserting GeoGebra Explorations from a LibreTexts Repository

The GeoGebra exploration below comes from the collection of GeoGebra explorations in the repository mentioned above on the LibreTexts Math Library.

Frenet Frame GeoGebra Exploration



Visualization created by Juan Carlos Ponce Campuzano.

To add this GeoGebra exploration to this page, you would first need to locate it by name on the repository page described above. Then **Edit** the LibreTexts page where you wish to insert it. Next select the **Elements** option shown along the top bar of the page editing window, and on the Elements menu, select the **Content reuse** option (shown in Figure 5.10.1).

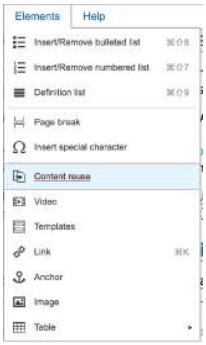


Figure 5.10.1: Elements menu, showing **Content reuse** option

Selecting the Content reuse option allows us to add content from anywhere else in the library. You will see the following window (shown in Figure 5.10.2).

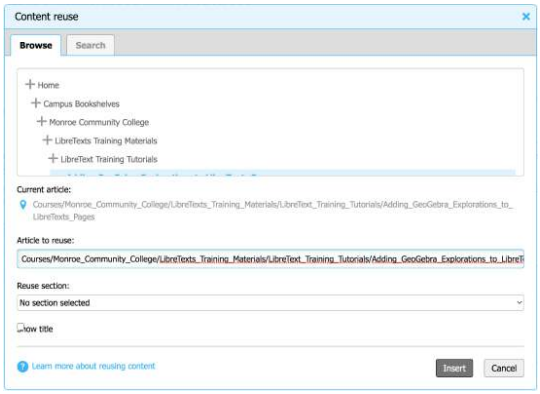


Figure 5.10.2 The **Content reuse** dialog

To navigate to the Learning Objects folder, click on the plus symbol in front of the word Home. The list of folders should now appear like Figure 5.10.3 below.

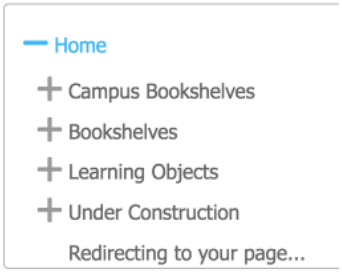


Figure 5.10.3 List of folders shown when we click the plus symbol in front of Home

Now click on the plus symbol in front of Learning Objects should display a list similar to that shown below in Figure 5.10.4

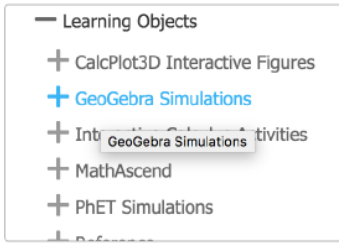


Figure 5.10.4 A list of available Learning Objects

Clicking the plus sign in front of GeoGebra Simulations should reveal a list of the current GeoGebra explorations in this repository. Scrolling down to locate the Frenet Frame exploration, it should look similar to what is shown in Figure 5.10.5

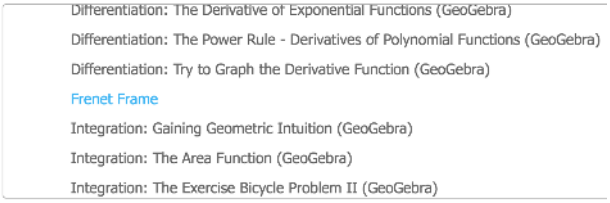


Figure 5.10.5 A list of available GeoGebra explorations

Selecting the Frenet Frame exploration causes the Content reuse dialog to appear as shown below in Figure 5.10.6

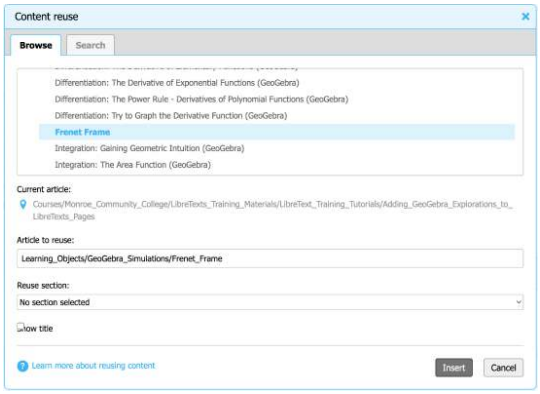


Figure 5.10.6 The Frenet Frame exploration has been selected

Note the address of the Frenet Frame exploration within the LibreTexts Math Library is shown under **Article to reuse**. If you select the checkbox labeled **Show title**, the title of the exploration will be automatically displayed just above the exploration on your page. If this checkbox is left unselected, this title will not appear.

Finally, once you are ready to insert the exploration into your page, click the **Insert** button in the lower-right corner of the dialog. A content reuse placeholder like the following will appear in the page editing window. To see your inserted GeoGebra exploration in action, save the page.

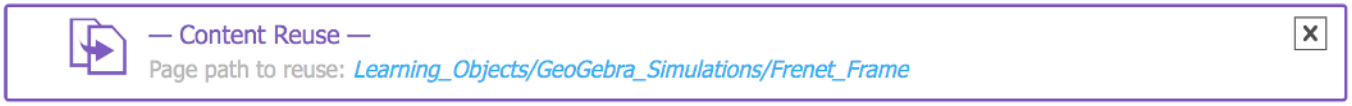


Figure 5.10.7 Placeholder for the content reuse of the Frenet Frame GeoGebra exploration

Inserting GeoGebra Explorations from a Different LibreTexts Library

If you decide you'd like to insert a GeoGebra exploration from a LibreTexts library other than the one in which you are building your custom text, this can be accomplished using a Cross-Library Reference, the library subject area, and the Page ID number for the GeoGebra exploration you have selected.

Say we wish to insert the following GeoGebra exploration from the LibreTexts Math Library on a page in another LibreTexts library (say Chemistry or Physics).

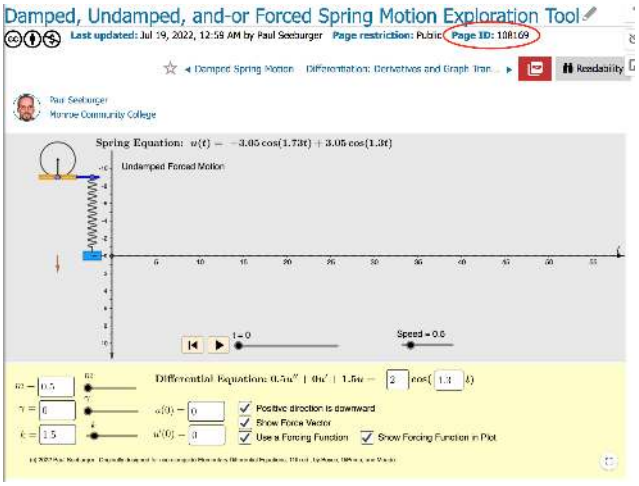


Figure 5.10.6 Static image of a GeoGebra exploration from the LibreTexts Math Library, with its Page ID circled in red.

We would need to create a new page, name it, and then save it (before editing it) to set it up with the correct codes. Then we would edit the page again and click on the </> HTML button on the right end of the editing toolbar. Enter the following code.

```
<p class="mt-script-comment">Cross Library Transclusion</p>

<pre class="script">
template('CrossTransclude/Web',{'Library':'math','PageID':108169});</pre>
```

Saving your page should reveal the GeoGebra exploration you wanted. This code could also be placed inside a LibreTexts page with other text and figures, or you could set up a collection of explorations each in their own page that you could easily place in other pages using the Content Reuse approach described above.

Note

This Cross Library Transclusion code can be used to insert any content from another library into your custom LibreTexts.

Inserting GeoGebra Explorations from the GeoGebra Website

First go to the GeoGebra website (https://www.geogebra.org/) and locate an exploration that you would like to insert into LibreTexts. If you've created one of your own, feel free to use that! You'll just need the URL of this exploration when we are ready to indicate which exploration we want to insert below.

There are a lot of more advanced programming features that can be used in this process. But for most purposes, we will not need to get this complicated to insert an interactive GeoGebra exploration in a LibreText, so I will not get into these more advanced techniques here.

Note: Exploring Advanced Features

If you are curious to learn more about how some of the GeoGebra explorations in the repository are set up, you copy the GeoGebra exploration from the repository to your sandbox (either using the remixer or creating a new page and then using content reuse) and then fork the page. This will allow you to explore the code needed to accomplish using buttons and text output displays that are external to a single GeoGebra exploration window or to coordinate two separate GeoGebra applet windows.

Although a GeoGebra exploration likely could be inserted directly into a LibreTexts page with other content, I strongly recommend that you create a new (separate) page for each GeoGebra exploration you wish to insert, in a subdirectory of your campus bookshelf dedicated to GeoGebra explorations (perhaps titled **GeoGebra Explorations**) and then use the content reuse approach shown above to locate and insert these explorations into your page. This approach keeps the code for each GeoGebra exploration clearly separate and allows these explorations to be more easily shared among multiple books once they have been created.

This approach also provides an excellent template to use for creating more GeoGebra exploration pages for your LibreTexts. Once you have one of these created, you can just use the Copy option under the Options menu on the page to create a new GeoGebra exploration page. There will be no need to fork the page. You'll just have to edit the code as shown below.

The first time (to get started), I recommend that you copy one of the following GeoGebra explorations from the repository into a page of your own.

Accumulation Function Curve Sketching Example 1 or **Accumulation Function Exploration Tool**

You can use the Remixer to do this or you can create a new page using the New button and use Content reuse (as described above) to insert just this exploration into the page.

Note: Using the New Button to Create a New Page

Note that if you create a new page using the **New** button, you should always name and save the page first, then edit it again to add content or use Content reuse (as we need to do to insert the existing exploration above). This maintains the tags that indicate that this page is a section.

Once you have the copy of the exploration in your page, save it and then fork it, either clicking on the fork symbol just to the right of the title (if it is there), or using the Forker option in the Options menu.

Edit the page and click on the HTML button. You will see code like the following:

```
<meta name="viewport" content="width=device-width,initial-scale=1" /><meta charset="utf-8" /><script src="h
<div id="ggb-element"> </div>
<script>/*<![CDATA[*/
    var params = {"appName": "classic", "material_id":"vy5cfdug", "width": 1260, "height": 657, "scale": 0.
    var applet = new GGBApplet(params, true);
    window.addEventListener("load", function() {
        applet.inject('ggb-element');
    });
/*]]>*/</script>
```

If you used the remixer or content reuse to create the page and then forked the page, you will likely also see some comment code that you can freely delete, possibly both above and below the code shown above.

Now find a GeoGebra exploration that you want to insert. Its web address (URL) should look something like the following:

https://www.geogebra.org/m/ykqc5be6

Note that the material id for this exploration is the sequence of letters and numbers after the base URL: **https://www.geogebra.org/m/**. That is, in this case, the material id is **ykqc5be6**.

Copy just this material id code and paste it in the parentheses following "material_id", replacing the current material id. (In the example code above, this code is "vy5cfdug".)

Save the page and you will see your new exploration appear. You may need to adjust the width and height settings to allow all parts of the exploration to appear, and you can experiment with the other settings shown in the code above on the line beginning with "var params =".

Note: Giving Credit to the Author of the GeoGebra Exploration

Be sure to clearly indicate who authored the GeoGebra exploration that you have imported, if it is not already displayed. It is best to include it just below the exploration on its own page.

Now that you have your new GeoGebra exploration in its own LibreTexts page on your campus bookshelf, you can use the content reuse approach described in the first part of this tutorial to insert this GeoGebra exploration into a regular LibreText textbook page. To do this, you will need to navigate to your campus bookshelf using the Content reuse dialog.

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5.11: Adding WeBWorK Problems to LibreTexts

Adding WeBWorK problems to check for student understanding at appropriate places in your LibreTexts can keep students engaged and help them work out the details of definitions, concepts, and theorems.

Although Adapt can allow you to incorporate graded "summative" problems (WeBWorK, H5P, MyOpenMath, etc.) into your LibreTexts, this tutorial will focus on various ways to insert WeBWorK problems into LibreText pages for formative feedback, i.e., to help students check and refine their understanding.

Browsing Available WeBWorK Problems

Two methods to browse available WeBWorK problems are:

1. Use the Library Browser in any WeBWorK course on a WeBWorK server
2. Use the LibreTexts Query Library to locate WeBWorK problems

Library Browser: Once logged into a WeBWorK course with appropriate permissions, you can use the Library Browser link to search the contents of this library for appropriate problems to insert in your LibreTexts. Here you will need the OPL address to insert a WeBWorK problem into a LibreTexts page. We'll discuss this more below.

If you do not have access to a WeBWorK server, it is possible that you could use the LibreTexts WeBWorK server to explore the OPL in this way. If you are interested in this possibility, please request access.

You may find this page about the WeBWorK OPL (Open Problem Library) helpful: https://webwork.maa.org/wiki/Open_Problem_Library

Browsing Query: First, you will need to access the LibreTexts Query WeBWorK library page. Then you can use the topical folder names to dig through the contents of the OPL (Open Problem Library) that are housed in Query. Note that what you'll need to insert a WeBWorK problem from Query is its **page ID**. We'll discuss this more below. Also note that you do NOT need to be logged in to Query to browse problems.

One other thing to consider is that browsing Query may allow you to find other types of problems as well (not just WeBWorK). And these can be inserted into LibreTexts pages using the same method as we show for a WeBWorK problem below.

Inserting Formative WeBWorK Problems into a LibreTexts Page

Even when used formatively, there are currently three methods to insert WeBWorK problems into your LibreTexts pages. Each method has its advantages and the method you choose may depend to some degree on how much experience you have with WeBWorK.

Inserting a WeBWorK Problem Using its OPL (Open Problem Library) Address

This method is great for those who have access to WeBWorK and either know which problems they wish to use from their own assignments or can use the Library Browser in WeBWorK to locate appropriate problems and obtain their OPL address.

Say we found a problem in the OPL with the following address that we want to insert.

```
Library/Michigan/Chap7Sec1/Q77.pg
```

Select Elements > Templates > Template:QueryWebWork



Figure 5.11.1 Selecting the WeBWorK template to use with an OPL address.

Once the template is added to the page, all you have to do is change the address of the problem to the one you located in the previous step. Note that you will need to click on the + sign on the DekiScript object to open the attributes for the template. See Figures 5.11.2 and 5.11.3 below.

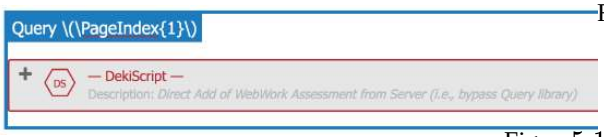


Figure 5.11.2 New QueryWeBWorK template

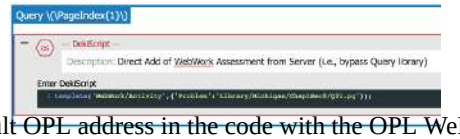


Figure 5.11.3 QueryWeBWorK template opened

Replacing the default OPL address in the code with the OPL WeBWorK problem address we found above gives us:

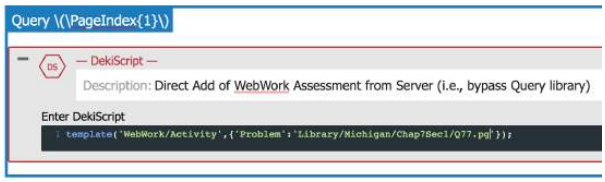


Figure 5.11.4 QueryWeBWorK template with new OPL problem address

Once the page is saved, this will render the problem as:

Note that this problem is labeled as a Query even though it did not come from the Query database. This is intentional, as these types of interactive questions are being called Queries in LibreTexts.

Inserting a WeBWorK Problem Using its Query ID

This method may be easier for anyone who is not as familiar with WeBWorK and/or who does not have access to a WeBWorK course and the OPL Library Browser. It uses the page ID for the corresponding problem in the LibreTexts Query problem database.

As mentioned above, another advantage of this approach is that it can be used to insert problems of any type that you find in the Query problem database. Just find the page ID and insert it in the template as we show below and the problem will render in your LibreTexts page.

Now from the Query database, let's say we found the following problem:

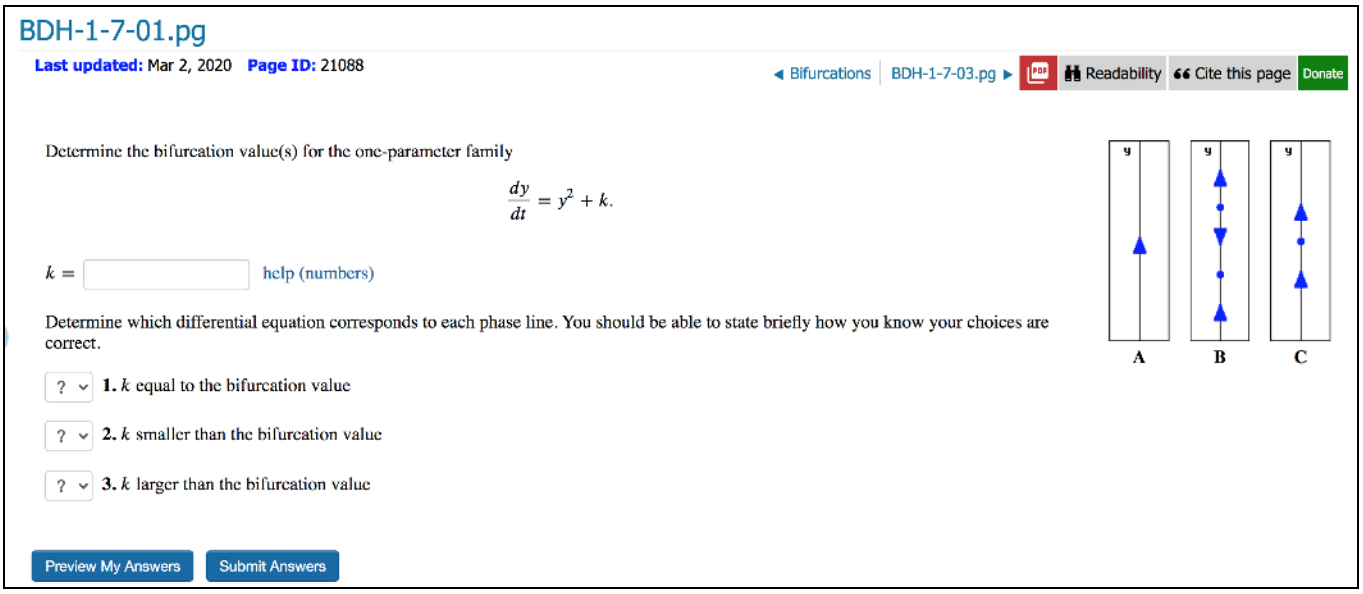


Figure 5.11.5 WeBWorK problem in Query

Note the **Page ID: 21088** just below the problem title. We will need this number to identify this problem in the template.

Now select Elements > Templates > Template:BoxQuery

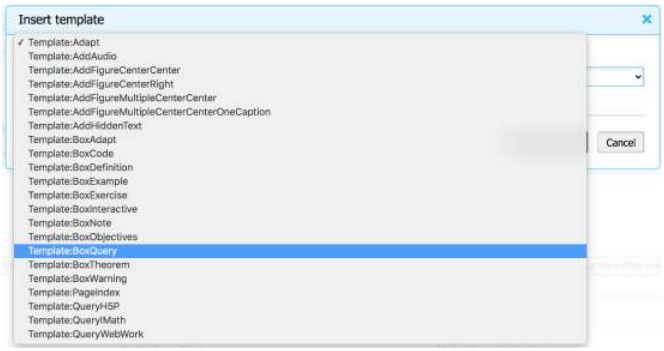


Figure 5.11.6 Selecting the BoxQuery template to use with a Page ID.

Once the template is added to the page, all you have to do is change the Page ID of the problem to the one you located in the previous step. Note that you will need to click on the + sign on the DekiScript object to open the attributes for the template. See Figures 5.11.7 and 5.11.8 below.

Figure 5.11.7 New BoxQuery template



Figure 5.11.8 : BoxQuery template opened



Replacing the default Page ID in the code with the Page ID for the WeBWorK problem we found in the Query database (21088) above gives us:

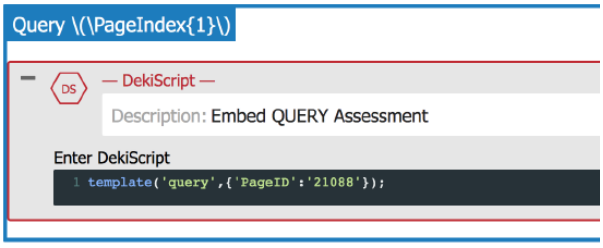


Figure 5.11.9 BoxQuery template with new Page ID

Once the page is saved, this will render the problem as:

Note that we can update the PageIndex appropriately as we insert new Query problems.

Inserting a WeBWorK Problem from Your own WeBWorK Server

This method is ideal for inserting your own created or customized problems in a LibreTexts page. It is currently still the least polished in its presentation, although this should soon be standardized to look like the other two methods above, using a new Template. This page will be updated once this is accomplished.

At this point, there is not a template for this method. We will be editing the HTML version of the page directly.

While editing the LibreTexts page that you wish to add a WeBWorK problem to, click the </> **HTML** button in the upper-right corner. This button toggles the editing mode between WYSIWYG and HTML. We can accomplish most editing tasks in LibreTexts without worrying about the HTML, but for this WeBWorK problem option, we need it.

You can copy-and-paste the following code to modify it appropriately to create your linked WeBWorK problem. The base WeBWorK server URL has been formatted to show it is code, but the rest of it should copy-and-paste correctly.

<iframe frameborder="1" height="250" src="
https://demo.webwork.rochester.edu/webwork2/html2xml ?
&answersSubmitted=0&
&sourceFilePath=Problems/CalcIII/DivCurl/ur_vc_12_9.pg&
&problemSeed=123567&
&courseID=seeburger_course&
&userID=daemon&
&course_password=daemon&
&showSummary=1&
&displayMode=MathJax&
&problemIdentifierPrefix=102&
&language=en&
&outputformat=sticky" width="100%"></iframe>

This code will generate the following WeBWorK problem, served up from an external WeBWorK server. Although it is not really a custom problem, it could be.

Note that you can specify your desired WeBWorK server and the path to the problem inside the course you set up for serving these problems. The courseID is the course name, and you need to create a user named “daemon” with password “daemon” and permission set to “login_proctor” in that course. Alternatively, you could use "anonymous" instead of "daemon". Just be consistent.

The path can be a Library problem too, although we recommend you use the QueryWebWork template described above unless you wish to use custom problems.

You can use the Library Browser in the WeBWorK course you use to locate any problem available there, even in your local customized problem sets.

Putting these WeBWorK Problems in a Query Box

If you wish it to look more like the other problems, we can use the BoxQuery template for that, although there may soon be a custom template for this feature as well with appropriate parameters.

To get the problem inside of a Query Box, I added the BoxQuery template, then switched to HTML mode and replaced the code:

```
<p class="mt-script-comment">Embed QUERY Assessment</p></br>
<pre class="script"></br>
template('query',{'PageID':'35292'});</pre>
```

with the HTML code for the desired WeBWorK problem.

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CHAPTER OVERVIEW

6: Contributing, Harvesting, and Curating Content

6.1: Harvesting Workflows
6.2: A Harvesting Checklist
6.3: More Advanced Typesetting Standards
6.4: Contributing Existing Content (FAQ)
6.5: Dynamic Indexes
6.6: Auto-Population of Page Key Terms (meta-tags)

Thumbnail: pixabay.com/photos/batter-cake-food-cooking-dessert-19633/

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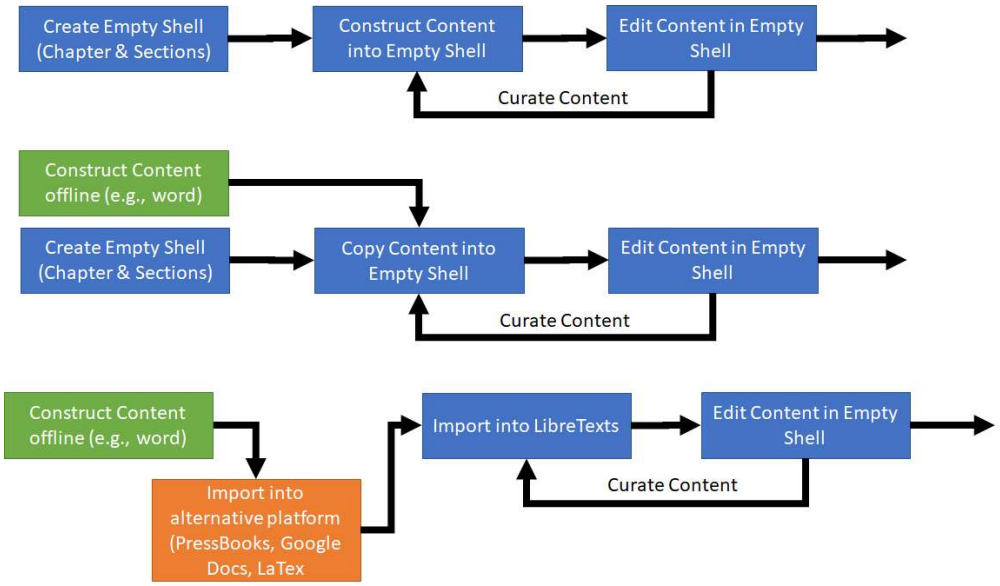
6.1: Harvesting Workflows

Development of content in the LibreTexts platform proceeds via five mechanisms operating in parallel:

- *Mechanism 1:* Student contribution from **scratch** (e.g., via extra credit)
- *Mechanism 2*: Student integration of **existing** content outside the LibreTexts platform from faculty and experts
- *Mechanism 3:* Faculty construction of raw content from **scratch**
- *Mechanism 4:* Faculty integration of **existing** content outside the LibreTexts platform from faculty and experts
- *Mechanism 5:* Faculty and student re-editing of content already existing on the LibreTexts (with permission)

Modules from all five mechanisms are processed through a sophisticated vetting structure, involving students and faculty (see below), to eventually guarantee reliable, fully-vetted content that is capable of substituting for that found in current paper-based textbooks. Content from higher ranked mechanisms typically supersedes content from lower ranked mechanisms, resulting in the continual evolution of the LibreTexts content.

There is a range of different workflows possible for constructing texts and selecting the best workflow is an individualize or team decision. There are tools to facilitate construction efforts with the Remixer as most powerful.



Harvesting project follow different workflows depending on the nature of the content and the nature of the format of the content. Below are several established workflows that may be followed in harvesting projects.

From Scratch

- Step 1: Build the empty Text Skeleton - User Remixer (**New Remix** mode)
- Step 2: Add content individually to each page (i.e., page-by-page copy and pasting or direct editing)
- Step 3: Edit and typeset pages individually as needed
  - Use Remixer to reorganize pages
  - Use page editor for curating content on pages

From Website (online)

- Step 1: Build the empty Text Skeleton - User Remixer (**New Remix** mode)
- Step 2: Add content individually to each page (i.e., page-by-page copy and pasting or direct editing)
- Step 3: Edit and typeset pages individually as needed
  - Use Remixer to reorganize pages
  - Use page editor for curating content on pages
  - Use Mathpix for OCRing equations as needed

From PDF

Mechanism I

- Pull PDF into google doc (via uploading to google drive)
- Follow **Google Doc** workflow

Mechanism II

- Build the empty Text Skeleton
- Copy & Paste content into each page individually
- Edit and typeset pages as needed
- Use Mathpix for OCRing equations as needed

From Word *Mechanism I* • Pull PDF into Google doc (first upload pdf to Google Drive, then select "Open in Google Doc") • Follow **Google Doc** workflow *Mechanism II* • Build the empty Text Skeleton • Copy & Paste content into each page individually • Clear formatting as needed since word generates messy code) • Edit and typeset pages as needed • Use Mathpix for OCRing equations as needed • User GrindEQ to convert MS equations to latex	**From Google Doc** *Mechanism I* • Convert to EPUB file • User LT Importer to import EPUB file (admin use only) • Edit and typeset pages as needed *Mechanism II* • Build the empty Text Skeleton • Copy & Paste content into each page individually • Edit and typeset pages as needed • Use Mathpix for OCRing equations as needed	**From EPUB/Common Cartridge** • User LT Importer to import EPUB file • Edit and typeset pages as needed If the EPUB is unvalidated (poorly constructed), then the LT importer will not generate all pages and will push chapter content into single pages. If this happened, then user Remixer (in remix mode) to flesh out the text generated from the Importer (e.g. add relevant pages).
From Latex Source • Build the empty Text Skeleton • Use Pandoc to convert latex source code to html/mathjax code ◦ The command line code to use is "pandoc --mathjax -t html5 input.tex -o output.txt" • Copy & Paste content into each page individually (as html source instead of GUI front end) • Edit and typeset pages as needed	**From Pressbooks** *Mechanism I (if EPUB export option is available)* • Export text into EPUB • User LT Importer to import EPUB file (admin use only) • Edit and typeset pages as needed • Use Mathpix for OCRing equations as needed *Mechanism II (if EPUB export option is not available)* • Import into LT Pressbooks instance (admin use only) • Export text into EPUB • User LT Importer to import EPUB file (admin use only) • Edit and typeset pages as needed • Use Mathpix for OCRing equations as needed	**From Lumen (modified Pressbooks)** Lumen platform is really a Pressbooks platform slightly modified with no export options (OER content is fettered). • Import into LT Pressbooks instance (admin use only) • Export text into EPUB • User LT Importer to import EPUB file (admin use only) • Edit and typeset pages as needed
From EPUB3 *Direct Importer under development* • Pull into EPUB reader and follow Website workflow	**From XML** *Direct Importer under development*	**From Pretexts** Requires admin access to the importer to harvest.

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6.2: A Harvesting Checklist

This section is an overview for people who are tasked with copying a whole structure from a website into the LibreTexts format. It is short and does not contain everything so as to not overwhelm developers. It assumes that the content is copied into an empty skeleton textbook map with pre-made chapters and sections which we will set up for you if necessary.

Pre-Editing Stage

- **Step 1**: Obtain an instructor's account. This is either given via email from the LibreTexts team directly (e.g., via info@libretexts.org) or via the network of LibreTexts facilitators (e.g., on your campus).
- **Step 2 (Optional)**: Ensure that your campus has a campus hub in the library. This is optional as working projects can be stored in the general use "Remixer University" Campus Hub until a Campus Hub for your institution is created (upon request to the LibreTexts Team).

Of the workflows discussed in the previous section, the most common involves building a skeleton and manually copying and pasting content ("From Scratch", "From Website", "From PDF", "From Word (mechanism II)", "From Google Doc (mechanism II)" and "From "Latex source" workflows). Below is a more detailed overview of this process.

Step 1A: Build the Infrastructure (the easy way)

- Use the Remixer to build the skeleton from scratch

Step 1A: Build the infrastructure (the Hard Way)

- Rename the chapter titles to the desired titles (hover over title to get pencil icon to do this and then edit and save): use the format "1: I love LibreTexts" and "2: I really love Libretexts" as the general format with a colon and no "chapter" word
- Rename the existing sections within each chapter to the desired section. Use the format "1.X: Ways that I love Libretexts" and "1.2: Ways that you should love Libretexts" as the general format with a colon after the second number. Avoid using a three number title, e.g., "1.2.3: Ways that Titles Can Be Poor"
- As a general rule, copy everything over even if it is not entirely clear that it will be useful. We can always delete or move things around later.
- If you need to make new sections, then do so (via the "New" button on the black bar after you are logged in).
- If your original sections do not have numbers in them, then ignore the numbers (for now).
- We can address thumbnails (the images on the chapter boxes) later on.

Step 2: Copy and Paste

- For each section of original material, do a simple cut and paste from the website into each LibreTexts section (after clicking "Edit" on black bar after you are logged in).
- When you do this, all text is copied over (often with undesired formatting) and the images from the original content are NOT transferred over (only a link back to them to give you that image). If the formatting is messed up in any way (e.g., small font, bad font etc), then it is best to just erase the formatting (the "removed format" button on the edit toolbar that looks like a T with a little x next to it). That is your best friend.

Step 3: Upload Figures on to Libretexts Page

- The simplest way to do this is to drag the figures from the original page onto your desktop, then drag them from your desktop into the appropriate spot on the LibreText page. You can find more details on how to do this here.

Step 4: Format/Edit the Page

Typically, the original content will not be in a format that “fits” into the existing format of the LibreTexts that it is to be integrated into. This includes: font size, colors, organization, etc. This is often best addressed at the initial steps if integrated by a straightforward “erasing” of formatting via the CKE editor (the eraser button). This then requires the reformatting of the content into the LibreTexts format.

- General Formatting plan:
- All section headings should use h2, h3, h4 …
- All text should be full justified (this is default and does not need to be selected).

- All number lists should use the CKE list options, this also includes bullets.
- Be sure to:
  - erase all indentations
  - avoid underlines (use bold or italic instead)
  - full justify all text
  - center justify all image captions
  - center justify all images (after copying them in properly, discussed below)

Step 5: Format Equations

- If there are equations, then you will need to convert them to MathJax (latex). Below are some tutorials to get people started:
  - https://www.tug.org/tutorials/tugindia/
  - http://meta.math.stackexchange.com/q...uick-reference
  - https://www.latex-tutorial.com/
- It is best to just look at MathJax code on the LibreText to get the idea. This helps to make nice equations (https://www.codecogs.com/latex/eqneditor.php).
  - DO NOT copy links to codecogs to make a latex image on our site; use the internal MathJax system via the `\(` and `\[` and `\)` and `\]` delimiters.

Step 6: Typesetting and Advanced Editing

- This is a more advanced stage that requires review by an advanced developer and includes fine tuning of things, such as table and figure captions, acknowledgements, table formatting, videos, hyperlinks to other pages, etc.
- Typically, a page goes through many revisions to get things "just right".

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6.3: More Advanced Typesetting Standards

One of the strengths of the Libretexts project is that all pages share similar formatting so it is easy to mix content from different sources. This page contains general formatting rules.

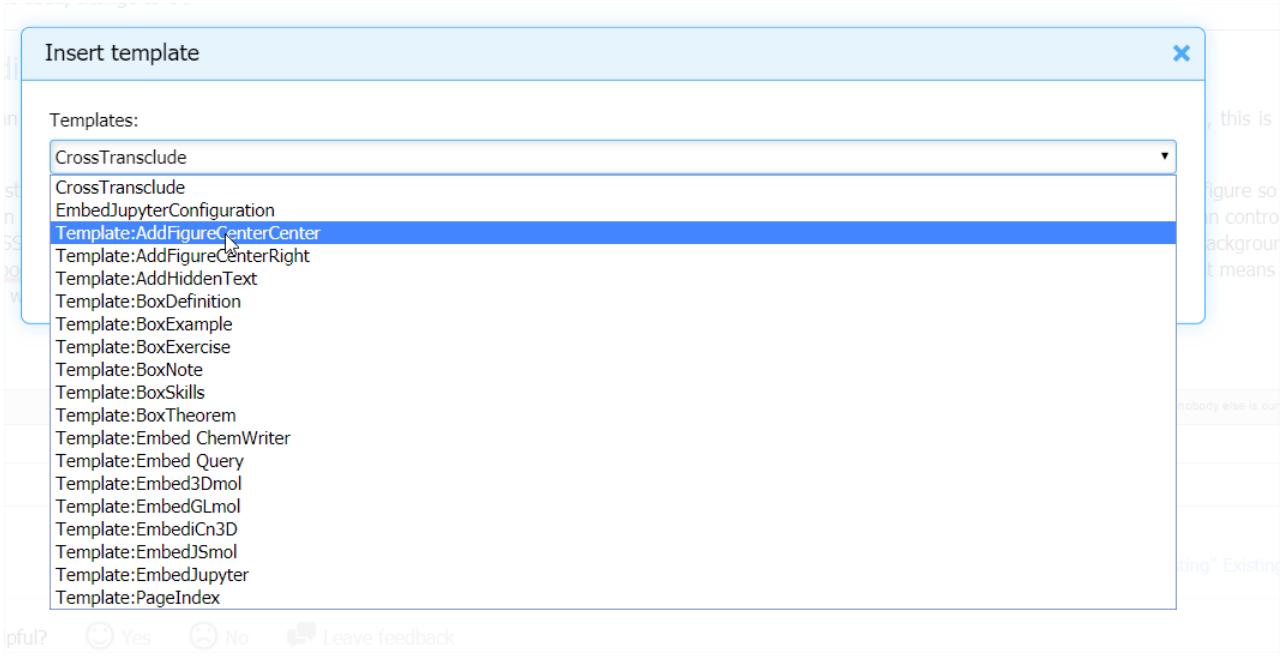
- All section headings should use h1, h2, h3, etc …
- All text should be full justified.
- All number lists should use the CKE list options, this also includes bullets
- Erase all indentations
- Try to avoid underlines (use bold or italic instead)
- Full justify all text (it is automatic, but can be overwritten)
- Format figures
- Make sure all equations are in MathJax, do not import as images

Units

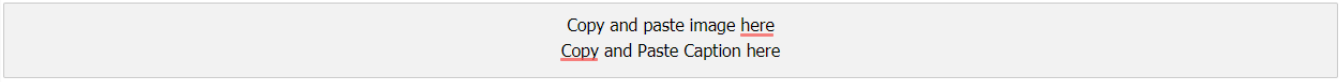
- Where possible, there should be universal adoption of SI units and formatting. To a large extent SI formatting has already been adopted by the contributors to LibreTexts. I note a few exceptions below.
- The energy of activation is preferably abbreviated as E_a, not Ea.
- Spaces should be inserted in long numbers, for example, 34 500 J/mol is preferred to 34500 J/mol.
- Spaces should be included between numbers and units. For example, 273 K is preferred to 273K.
- Use the degree symbol when describing degrees Celsius. For example, 25 ^{o}C is preferred to 25 C.
- Where ‘sec’ is used, change to ‘s’.

Figure Coding (ADVANCED)

While images can be added to pages directly as discussed previously, we have a more advanced system for tying a figure caption to the figure. For now, this is added by selecting the "AddFigureCenterCenter" template.



Once the template is embedded, there will be two spots to add the image and the caption.



This <figure> system is the HTML5 code for semantic representation of images. This allows us to tie in the figure caption to the figure so that they cannot be broken (e.g., by a page break in printing PDFs). It has several additional benefits as well. It acts as a that we can control over the entire site via CSS which allows for a standardization - this applies to the <figcaption> text that is tied to the <figure> code. It also provides a semantic background for the image so that Google and others can tie the figcaption to the figure.

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6.4: Contributing Existing Content (FAQ)

Is LibreTexts currently accepting proposals for new textbooks?

Yes. The LibreTexts is a community based project and always will accept new (quality) content.

Is there a cost to the author or organization to host a book on LibreTexts?

No.

Is there a process for authors to upload and maintain their material on the site?

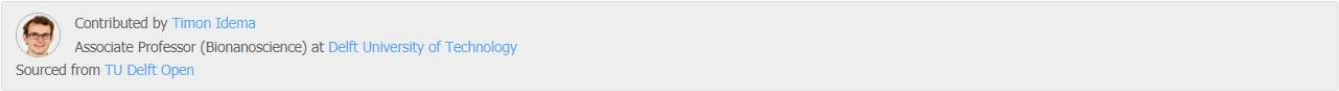
Yes. All contributed content is stored in a wiki-based architecture which is the ideal technology for community-based construction and community-based curation.

The best practice to follow for integrating content depends strongly on the format of the content (e.g., handwritten notes, PDF, word doc, Google doc, latex etc). The LibreTexts development team will facility this process if the author(s) decides to personally contribute content and if the authors desire, the LibreTexts Development team will integrate the text direct into our platform if requested.

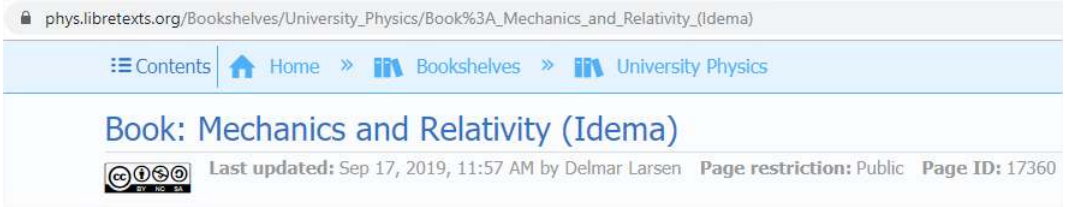
Curation is a simpler process and involves directly editing content on our platform via a GUI (graphical user interface) or direct editing of the underlying HTML code; most people chose the former option. Since the LibreTexts is the most visited OER platform on the internet today with over 80 million pageviews per year, we receive requests and concerns from faculty and students about content that we share with contributing authors to address. This feedback mechanism is an important tool in ensuring constant curation of contributed content.

How do authors get attribution for contributing content?

Each page of each book that is hosted on our platform **can** have an author bar added that includes author name (with a link to their individual webpage), their position and institution (with a link to their campus/dept. website) and if publishing source (if desired). Also, includes is a small avatar pic of the author. This template can be modified to address multiple authors. For example, Timon Idema's author bar below:



We also add author names to the textbook URL and textbook title



and if the content is remixable (i.e., does not have a No-Derivative clause), the we add a section at the bottom call "Contributors" to carry over in remixes.

How do authors get credit for contributing content?

Other than the "infinity glory and fame" associated with contributing content via the attribution aspects discussed above, the LibreTexts will track student activity on contributed content including how many student visit constituent pages, when student visited these pages, where the students are located and how long the students were reading these pages. This information can be used for both contributing authors' Merit and Promotions packets for demonstrating teaching impact. Moreover, if the contributed book were generated via a grant support, then this information can be used as a metric for deliverable (e.g. in grant reports or proposals like *Broader Impacts* in NSF proposals).

Remixing Control

There are many advantages to allowing for a dynamic on-line version of the book which can be updated by experts in the field. We understand that LibreTexts will provide the ability to reuse content from several books. How will LibreTexts handle author attribution for remixed books?

When authors remix existing content and do not change/customize that content, the page effectively gets copied over with authors preserved (i.e., an authorbar set to you with a meta-tag and we will add your name to the "Contributors" section at the bottom of each page. If someone edits the page (e.g., removes content that they do not care for) and adds something, then they can add their name to the contributor section. Your name in all those places will be preserved indefinitely.

Version Control

You are asking about revision control, which is an interesting topic. We are still working on the best workflow, but we intend to keep track of the original source page (or page #ID) so that we can compare the edits on each page. We have the capabilities of doing that with native tools on our platform, but we will set up a Gitlab instance that will bring arguably the best version control software into our platform and allow authors (both those that wrote the original content and those faculty that build remixes from the source material) to cherry pick changes they may or may not want to implement/share among the forked pages. I think this is really cool and I hope to have it operating natively on our platform by the end of this year.

Curating the Content

Unfortunately, zealots can hijack the website to promote their own propaganda or theories of the universe. I was told that the LibreTexts website will be curated to help maintain the quality and accuracy. Is this correct, and who will curate the LibreText website? Will it involve the original author?

Yes, no, and maybe. The content in the Bookshelves we take the responsibility to curate. We try not to curate remixes in individual faculty course shells since that can cause trouble. While we have faculty on our curation team to do this work, we gladly accept help from the original authors if they want to stay in the picture. If this is the case, when issues arise (e.g., feedback is given) we will consult with those authors (unless the issue is minor editing/typesetting that we can handle instantly).

Can the LibreTexts support streaming media, i.e. videos? If so, is there any kind of bandwidth limitations?

We currently do not stream from our servers. We can embed images via secondary servers like YouTube and can store the whole video (e.g., as MP4). We have had discussions of moving into streaming to avoid several issues with YouTube (e.g., ads).

Long-term Viability

Major books in Classical mechanics, such as Goldstein's book, published in 1950, remain available in libraries and from book publishers, providing valuable long-term access. Such long-term availability of textbooks is important in science. LibreTexts is based on the proprietary closed platform maintained by Mindtouch. If that company goes out of business, will LibreTexts have the resources to migrate to an open platform to provide a viable long-term repository?

A complete discussion of our sustainability model takes time. The upshot is that we have a consortium called the LibreNet where institutions provide subscriptions fees that will keep us afloat. This is based on scale, so the cost per campus is low depending on campus size, scope and affluence. Yes. We would switch to a different wiki technology. It will be painful, but in this situation we would have to do it. We have contingency plans in case a catastrophic event like this occurs, but it changes as alternative technology develops.

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6.5: Dynamic Indexes

Once a book or course has been compiled (i.e., added to the Download Center with PDFs and LMS common cartridge files available), the book will have a Front Matter and Back Matter automatically generated. The Back Mater will have a "Index" page that is is a dynamic index that is constructed by the meta-tags of the pages of the book.

For example, the index for Wakim and Grewal's Human Biology text can be access here:

https://bio.libretexts.org/Bookshelves/Human_Biology/Book%3A_Human_Biology_(Wakim_and_Grewal)/zz%3A_Back_Matter/10%3A_Index

You can see the term "abiotic factors" in the index at the top.

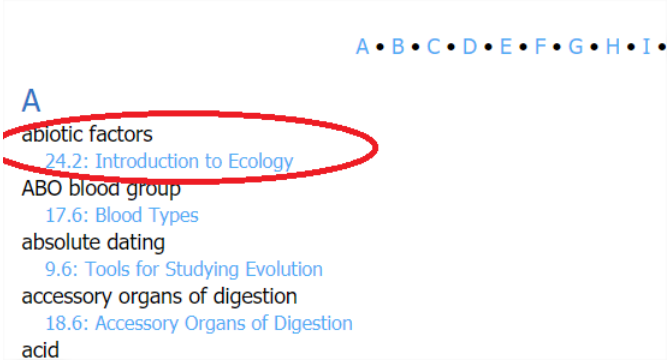


Figure 6.5.1: Copy and Paste Caption here

Section 24.2 is automatically added to the index under "abiotic factors" since that term was manually added to that page's Tags (in Page settigs).

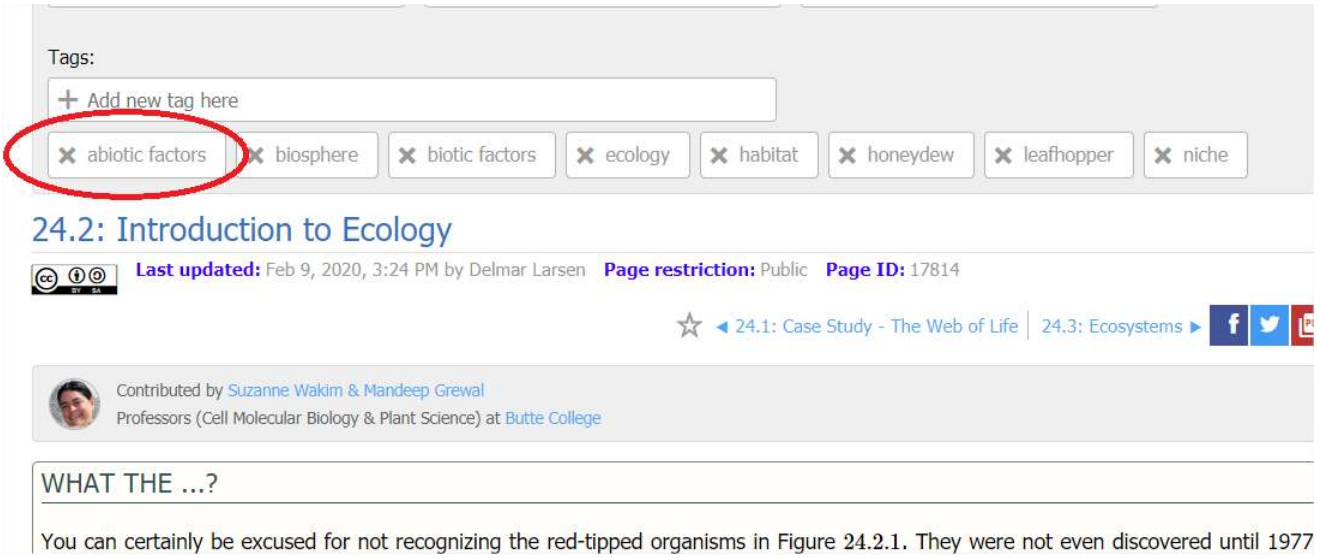


Figure 6.5.2: Meta-tags for Section 24.2 showing the tag "abiootic factors" has been manually added.

Since there are seven other meta-tags indicated for this page, it will be reflected multiple times in the index.

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6.6: Auto-Population of Page Key Terms (meta-tags)

The Dynamic Index require populating to be used effectively. While this can be done manually using the meta-tag approach in the previous section, an automatic tagger system is in place to facilitate the construction of comprehensive (book-wise) tagging.

This experimental system relies on the author to create a excel or google doc spreadsheet



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CHAPTER OVERVIEW

7: Remixing Existing Content

The OER Remixer is a self-service tool to rapidly assemble a customized Remix from existing sources on our comprehensive and ever growing libraries.

7.1: Definitions - Books, Remixes, and TextMaps
7.2: Building Remixing Maps
7.3: How to Make a LibreTexts Remix
7.4: Copy-Transcluded and Copy-Forked Remixes
7.5: Team Remixing

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7.1: Definitions - Books, Remixes, and TextMaps

There are three general classes of texts found in the LibreTexts: "Textbooks, "Remixes" and "Textmaps".

- **Textbooks** are texts that are original content that have integrated content into our library and are identified by "Book:" in their titles.
- **Remixes** are texts are created from existing OER content although often has topical or extensive editing by the remixing team to customize the text for the needs of an instructor or team of instructors. Constructing Remixes on the LibreTexts platform is facilitated by the OER Remixer tool. The title of the Remix often starts with the campus acronym (e.g., the Chemistry 110A remix at the University of California is "UCD: Chem 110A Introductory Quantum Mechanics")
- **Textmaps** are specialized remixes that are constructed to follow the organization of existing commercial textbooks. Textmaps facilitate adoption by faculty that are unable to switch from a commercial textbook to an OER alternative; these texts are identified by "Map:" in their titles.

Ethics and Legality of Textmaps

There was a court case in 1980 where the complaint was dismissed because, although the structure was the same, the "expression" i.e. writing was distinct. The more recent case from late 2018 says structure is part of the overall picture, and should be considered. It may be copyrightable if it were super creative, but not if it was "indispensable or standard" for the subject matter (494 F. Supp. 218). More from the case: "Similarities in chapter arrangement or structure matter less than the expressive content contain therein. Cf. Morrison v. Solomons, 494 F.Supp. 218, 225 (S.D.N.Y. 1980) (“The significant question is not whether titles of subchapters and chapters are the same but rather whether the explanation or treatment of the subject matter within them is substantially similar.”)."

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7.2: Building Remixing Maps

Before using the OER Remixer, it is important to construct a Remixing Map. This can take many forms and does not need to be constructed online. In essence it is a table of contents for your remix and a good place to start would be the ToC of a textbook that you like.

Remixing maps are best assembled in a spreadsheet, for example

Module	Course Content	Module Outcomes	OER Textbook	Assessments
I	**Introduction to Economics and Economics Systems.** A) Module Objectives B) Module Summary C) To Do List	Analyze the relationship between scarcity and choice and how basic economic choices are made in different economic systems. **CO 1**	**Economics: The Study of Choice** https://socialsci.libretexts.org/Bookshelves/Economics/Book%3A_Principles_of_Macroeconomics/01%3A_Economics%3A_The_Study_of_Choice	Discussion Topics 1 & 2. Test #1
II	**Supply & Demand Analysis** A) Module Objectives B) Module Summary C) To Do List	Use the market supply and demand model to show how a change in the market will affect the price and quantity of a good or service. **CO 2**	**Demand and Supply** https://socialsci.libretexts.org/Bookshelves/Economics/Book%3A_Principles_of_Macroeconomics/03%3A_Demand_and_Supply	Discussion Topic 3

or

Course Learning Objectives and Outcomes	Thematic Components/Parts	Libretext Material Link	Learning Objective
Module #1: Define diversity and diversity consciousness			
An Introduction to Workplace Diversity	#Organizational Behavior	https://biz.libretexts.org/Bookshelves/Management/Book%3A_Organizational_Behavior_(OpenStax)/05%3A_Diversity_in_Organization	1. Define diversity and diversity consciousness.
Diversity in the Workplace	#Organizational Behavior		1. Define diversity and diversity consciousness.
The Impact of Diversity in the Workplace	#Organizational Behavior		1. Define diversity and diversity consciousness.

Lubbock Christian University created an excellent excel sheet to help out in this procedure for their general chemistry course and an image of this excel sheet is shown below. The gist of this map is to identify the content in the libraries (green) that will map into the organization of the new remix (yellow). This requires faculty/instructional designers to explicitly peruse the Bookshelves of Source texts and of other Course Remixes to identify desired content.

Introductory Chemistry CHE1305 Lubbock Christian University

New Chapter number	New Name	New Section Number	Chapter section from Introductory Chemistry by Nivaldo Tro
1	Chemistry and Measurement	1.1	1.1 The Scope of Chemistry
		1.2	1.2: Chemicals Compose Ordinary Things
		1.3	2.5 The Basic Units of Measurement
		1.4	2.1 Taking Measurements, 2.3
		1.5	2.2 Scientific Notation: Writing Large and Small Numbers
		1.6	2.3 Significant Figures: Writing Numbers to Reflect Precision
		1.7	2.4 Significant Figures in Calculations
		1.8	2.6 Problem Solving and Unit Conversions ;
		1.9	2.7 Solving Multistep Conversion Problems
		1.10	2.9 Density
2	Atoms	2.1	4.1 Cutting aluminum until you get atoms
		2.2	4.2 Indivisible: The Atomic Theory
		2.3	4.4 The Properties of Protons, Neutrons and Electrons
		2.4	4.5 Elements: Defined by Their Number of Protons
		2.5	6.2 Counting Nails by the Pound
		2.6	6.3 Counting Atoms by the Gram
3	Isotopes	3.1	4.8: Isotopes - When the Number of Neutrons Varies
		3.2	4.9 Atomic Mass: The average Mass of an Elements Atoms
		3.3	17.2 The discovery of radioactivity
		3.4	17.10 The Effects of Radiation on Life
		3.5	17.3 Types of Radioactivity: Alpha, Beta and Gamma Decay
		3.6	17.5 Natural Radioactivity and Half-Life
		3.7	17.6 Radiocarbon Dating: Using Radioactivity to Measure the Age of Fossils and Other Artifacts
		3.8	17.11: Radioactivity in Medicine
4	Ions	4.1	4.7: Ions - Losing and Gaining Electrons
		4.2	9.4: The Bohr Model - Atoms with Orbits
		4.3	10.2: Representing Valence Electrons with Dots
		4.4	10.3: Lewis Structures of Ionic Compounds: Electrons Transferred
		4.5	9.3: The Electromagnetic Spectrum
5	Periodic Table	5.1	4.6: Looking for Patterns: The Periodic Table
		5.2	9.8: The Explanatory Power of the Quantum-Mechanical Model
6	Ionic Bonds	6.1	5.5: Writing Formulas for Ionic Compounds
		6.2	5.7: Naming Ionic Compounds

New Chapter number	New Name	New Section Number	Chapter section from Introductory Chemistry by Nivaldo Tro
9	Chemical Reactions	9.1	7.3: Chemical Equations
		9.2	7.10: Classifying Chemical Reactions
		9.3	7.9: Oxidation–Reduction Reactions
10	Amounts in Chemical Reactions	10.1	8.2: Stoichiometry
		10.2	7.4: How to Write Balanced Chemical Equations
		10.3	8.3: Mole-to-Mole Conversions
		10.4	8.4: Making Molecules: Mole to Mass (or vice versa) and Mass-to-Mass Conversions
11	Energy	11.1	3.9: Energy and Chemical and Physical Change
		11.2	3.8: Energy
		11.3	3.10: Temperature: Random Motion of Molecules and Atoms
		11.4	3.11: Temperature Changes - Heat Capacity
		11.5	3.12: Energy and Heat Capacity Calculations
		11.6	11.4: Phase Changes from Chemistry - The Central Science (Brown et al.)
		11.7	12.4: Evaporation and Condensation
		11.8	12.5: Melting, Freezing, and Sublimation
12	Gases	12.1	11.2: Kinetic Molecular Theory: A Model for Gases
		12.2	11.3: Pressure: The Result of Constant Molecular Collisions
		12.3	11.4: Boyle's Law: Pressure and Volume
		12.4	11.5: Charles's Law: Volume and Temperature
		12.5	11.6: Gay-Lussac's Law: Temperature and Pressure
		12.6	11.8: Avogadro's Law: Volume and Moles
		12.7	11.7: The Combined Gas Law: Pressure, Volume, and Temperature
		12.8	11.10: Mixtures of Gases: Why Deep-Sea Divers Breathe a Mixture of Helium and Oxygen
13	Concentration of Solutions	13.1	13.2: Solutions: Homogeneous Mixtures
		13.2	13.3: Solutions of Solids Dissolved in Water: How to Make Rock Candy
		13.3	13.4: Solutions of Gases in Water
		13.4	13.5: Solution Concentration: Mass Percent
		13.5	13.7: Solution Dilution
		13.6	7.5: Aqueous Solutions and Solubility: Compounds Dissolved in Water
		13.7	4.3: Ionic Equations - A Closer Look from Beginning Chemistry (Ball)
14	Separation of Solutions	14.1	11.5: Colloids from Chemistry (OpenSTAX)
		14.2	13.10: Osmosis

Once remixed, these pages can be then edited at the sub-page level (e.g., sub-sections, paragraph, pages etc). The Remixing Map reflects only the initial organization of a custom remix. Notice the customized organization; there is no limit other than imagination and the size/makeup of the LibreTexts libraries. While the Remixing Map below does not demonstrate it, it is possible to make placeholder pages in the Remixer if a gap exists in the libraries. New custom content can be added to these pages once the text is created or new open material brought into LibreTexts.

While it is easy to remix content that already is on LibreTexts, the LibreTexts team will bring in open material for you, although this may take some time, depending on the format of the materials and the amount of work that has to be done for such things as equations, images, accessibility issues, etc. Priority is given to materials for institutions that are members of the Libretexts Network. Requests can be made at https://harvest.libretexts.org.

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7.3: How to Make a LibreTexts Remix

This tutorial will walk you through making a customized text using the LibreTexts remixing tool. The Remixer tool can be used for simple tasks like creating a book that consists of select chapters of an existing resource or it can be used to create complex remixes consisting of multiple resources potentially across libraries. You can also create empty pages if you want to create your own content in parts of your customized book. Before creating a customized remix it is recommended that you construct a Remixing Map to guide you in building your remix text and this tutorial assumes that you have a remixing map prepared.

Analogy

It can be useful to think of the remixer as email and imap/POP3 application on a personal computer.

email	Remixer
Your emails are on an email server somewhere	Your texts are on the LibreTexts server
You download the email to your personal computer when you download emails to your email application	You download an image of your text to your personal computer when you" load a text" in the remixer or create a new text
When you want a newly constructed/edited email to sent (go live) your email browser talks to your email server	When you want a newly construction/edited text to be live, the remixer talks to the LibreTexts server (via "publishing).
With emails, if you edit/create an email and you didn't send it (upload to your email server), it doesn't go live (i.e., sent)	With the remixes, if you didn't publish the text (i.e., upload to the LibreTexts server), it doesn't go live (viewable on the LibreTexts websites)

With the remixer, any changes to a text (or a newly created text) will not be reflected on the LibreTexts server until you "**publish**" those changes (green button). They will be saved as remixing maps on your personal computer only.

Finding the Remixer

Each Library has a primary toolbar at the top (below the library logo) . The toolbar is black when a user with an instructor's account has logged in and grey otherwise. There is a blue toolbar on the far left. The Tools selection on the blue toolbar has an icon labeled "Remixer" that when clicked will load a new page with the Remixer for making customized textbooks on the specified library.



Figure 7.3.1: Primary toolbar for a library shown after user has logged in with an instructor's account.



Figure 7.3.2: Primary toolbar for a library shown if a user has not logged in with an instructor's account.

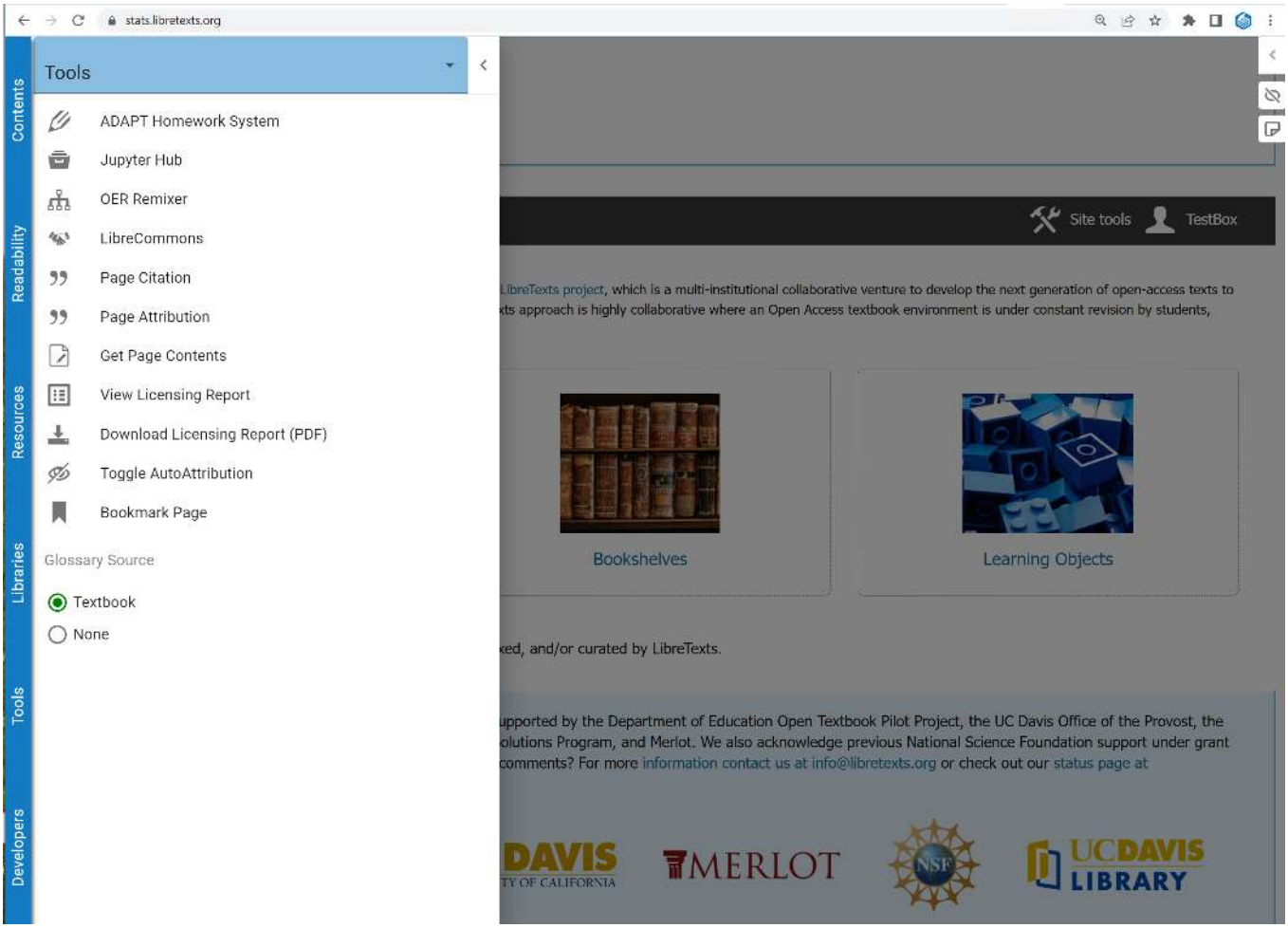


Figure 7.3.3: The blue toolbar at the far left in the Tools tab selected displays a menu with the OER Remixer selection third from the top

Getting Started

Since users without instructor's accounts can access the Remixer, the first step in using the Remixer is to confirm you can, in fact, use it to publish a remix (i.e., your account allows publishing new texts). The Remixer is activated by pressing the Remixer icon in the blue Tools tab menu, which will start up a new page (if this is the first time it is activated, it may take up to 15 seconds to load). Once loaded, if the Remixer screen has a dark grey bar with the term "Demonstration Mode" on the left (Figure 7.3.4), then you will not be able to publish your text. However, you can still create an online map of your customized text and save it for future editing/publishing. Register for an instructors account https://register.libretexts.org that lets you publish .

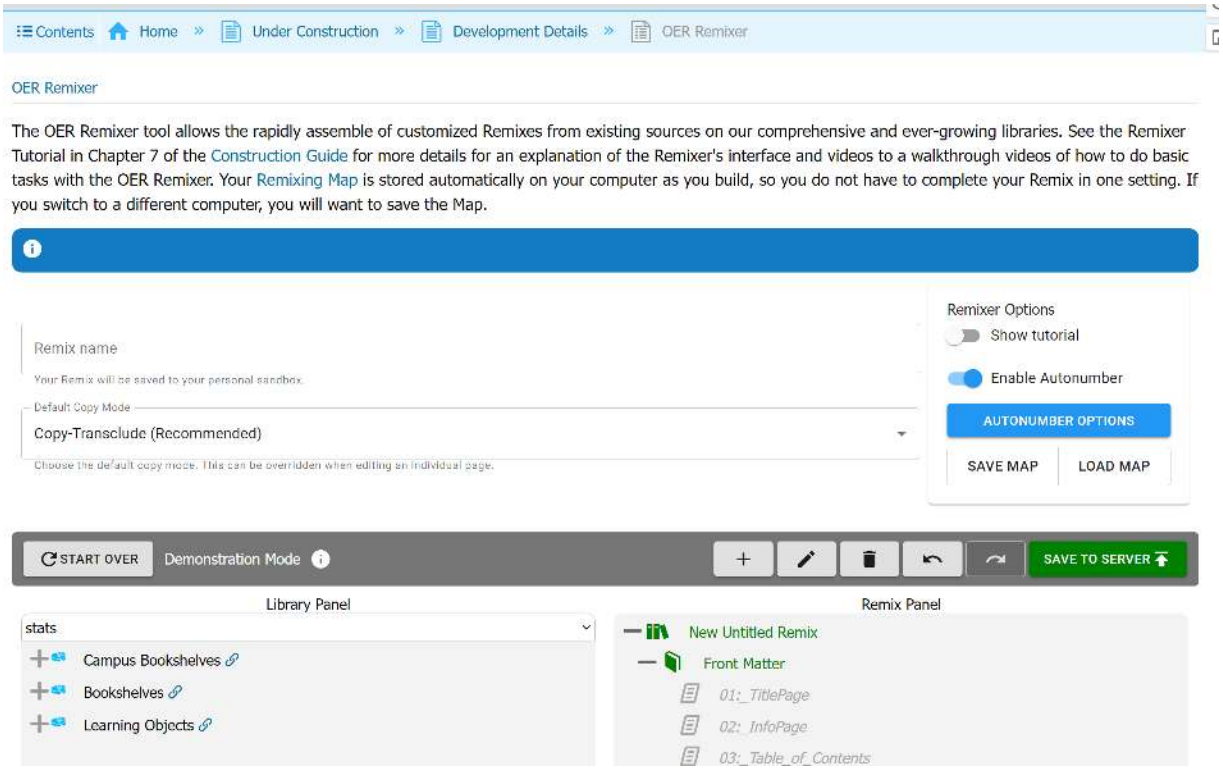


Figure 7.3.4: Example of thethe remixer in "Demonstration Mode"

When logged into an account with publishing privileges, the grey bar will turn black and the "Demonstration Mode" will switch to "Basic Mode" (Figure 7.3.5).

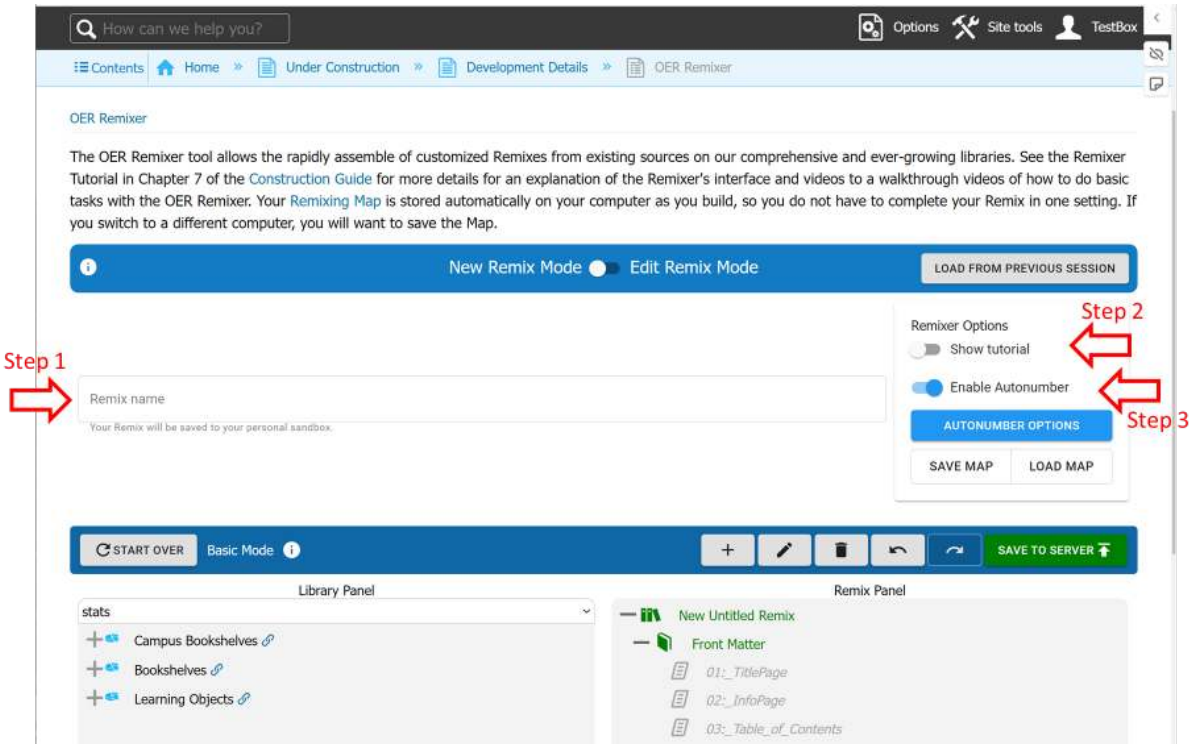


Figure 7.3.5: Example of the top of the remixer in "Admin Mode".

Creation Steps

Step 1: *Enter the name you want for your book (typically your name and the name of the class) in the box labeled "LibreText name" (Step 1 in Figure 7.3.5).*

By default, the Remixer generates "copy-transcluded" pages that mirror the original Master content. To edit the content on the new Remixed page, authors have to have to "fork" the page in the Editor to copy the content from the original master page into the new Remixed page. Copy-forked pages copy as traditional copied pages, which, once copied, can be edited independently of the content of the master page. You can convert individual sections/pages to distinct forked copies at a later time in order to customize them. Only developers and administrators can generate copy-forked pages directly in the remixer

Step 2: *A popup tutorial can be turned on by flipping this switch. Use as needed.*

Step 3: *The autonumberer ensures the constructed Remix follows a consistent number scheme and more importantly, adapts to the changing structure of the remix as new content is added, deleted or reorganized. It is recommended to turn this on (switched to the right). There are options available for the aut\nonumber (blue button below aut\nonumber switch); it is recommended to avoid these until users are more proficient with the remixer tool.*

Dragging and Dropping Content

The Remixer has two panels: The library panel and the Remix panel (Figure 7.3.6). The library panel on the left side contains the existing content on the LibreTexts libraries and the Remixer Panel on the right side is where you will create your new Remix. The basic remixing approach is to drag content with the mouse from the Library Panel to the Remix Panel. To insert a chapter or section from an existing book simply find it in the Library panel and drag it to where you want it in your remix.

Step 4: *Find content you desire to remix by selecting the library under "Library panel" (default is the library the Remixer was opened in) and page through the hierarchy tree. Once found, use the mouse to click on it and drag it to the Remix Panel. Content in the Remix panel will be green since this is a new page being created (ONLY after the Remix is published). You can continue to drag and drop content in different spots in your Remix Panel.*

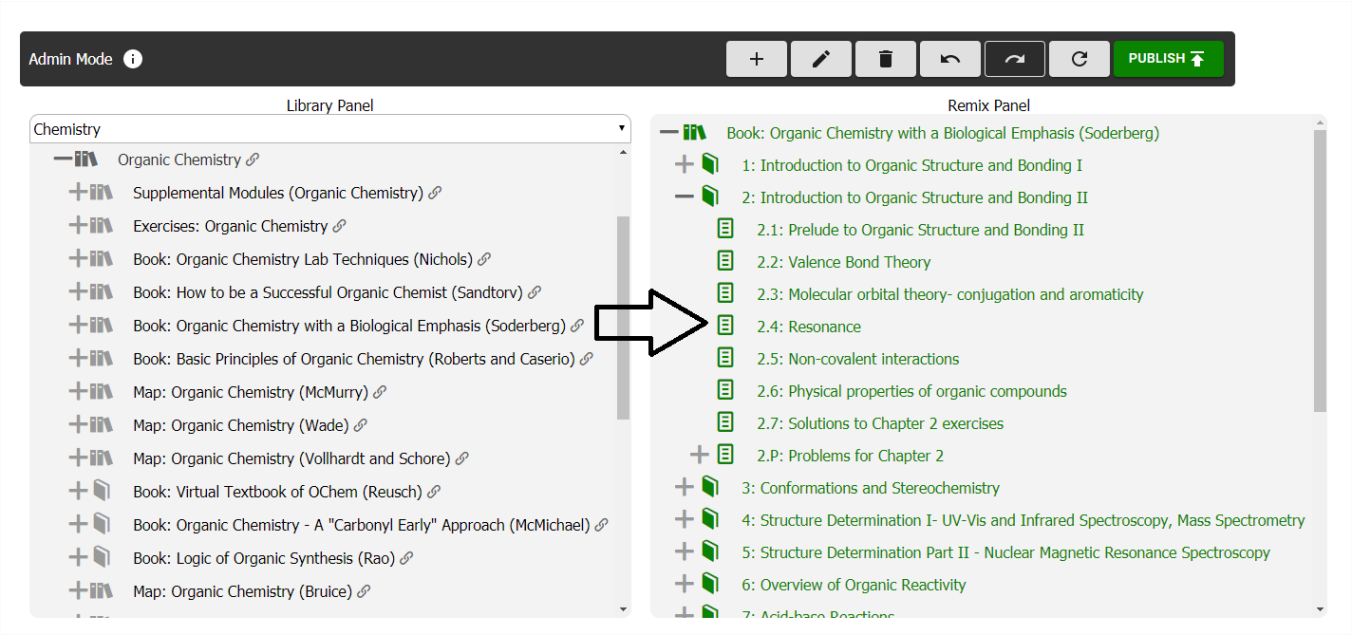


Figure 7.3.6: Working panel of the remixer. Left panel is the "Library Panel" that gives users access to the pages on all 13 libraries. The right panel is the "Remix Panel" i.e., the customized text. Content is dragged with the mouse from the Library Panel to the Remix Panel.

In both panels, the symbol indicates the top (book) level, the symbol indicates a chapter, and the symbol indicates a section (or subsection).

Users can Select content from any library

At the top of the Library Panel you will find the library selector, you can select material from any of our 13 libraries.

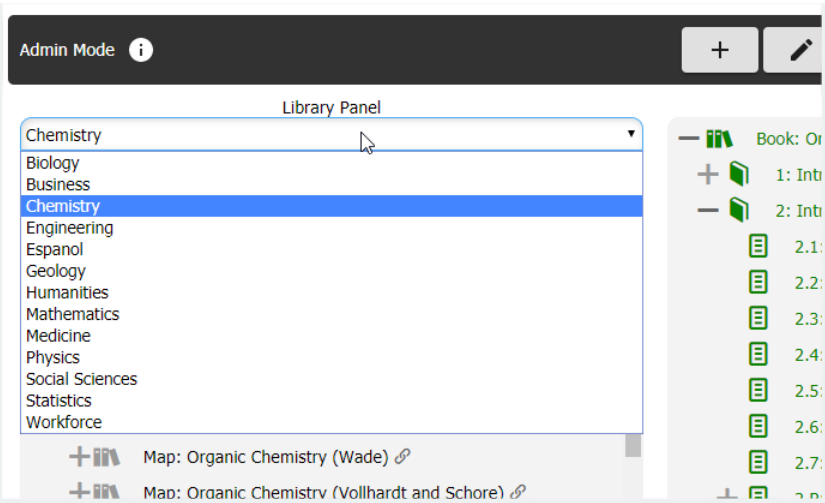


Figure 7.3.7: Users can select from content in different libraries on the platform. The first step is to select the library via pull-down menu.

Reorganizing Remix Content

You can edit your remix by inserting or deleting pages and dragging sections and chapters around as you desire. Above the Library and Remixer Panels is the editor bar (Figure 7.3.8). Here you can add a new (empty) page, change the title of a page or chapter, delete a page or a chapter, undo your latest changes, start over with a new remix, or publish a remix.

Step 5: *Rearrange chapters and pages as desired. If autonumber is on, the title numbers will adjust as you reorganize your content. Delete unneeded pages and add new content from the Library Panel. Actions can be reverted via the undo/redo buttons.*

The organization in the Remix panel will be automatically stored in on the user computer in the web browser's cookies. They can also be forced to be saved via the "Save Map" below the Autonumber Options (Figure 7.3.5). This allows you to share your remixing map across computers or with other people. It is recommended that you save each remix until you become comfortable with the Remixer.

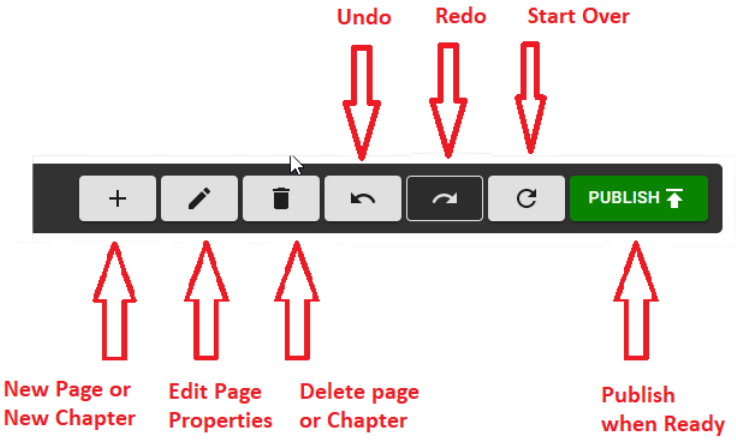


Figure 7.3.8: Users can use the editor bar to add a new (empty) page, change the title of a page or chapter, delete a page or a chapter, undo your latest changes, start over with a new remix, or publish a remix.

To change the name of a section or chapter first select it in the Remixing panel and then press "Page Properties" (button with pencil in Figure 7.3.8) or simply double click the page. Clicking on the "Page Title" text will allow users to manually change the name of that section in the remix (once published). The other properties in the Page Properties box are best reviewed once users are proficient with the Remixer.

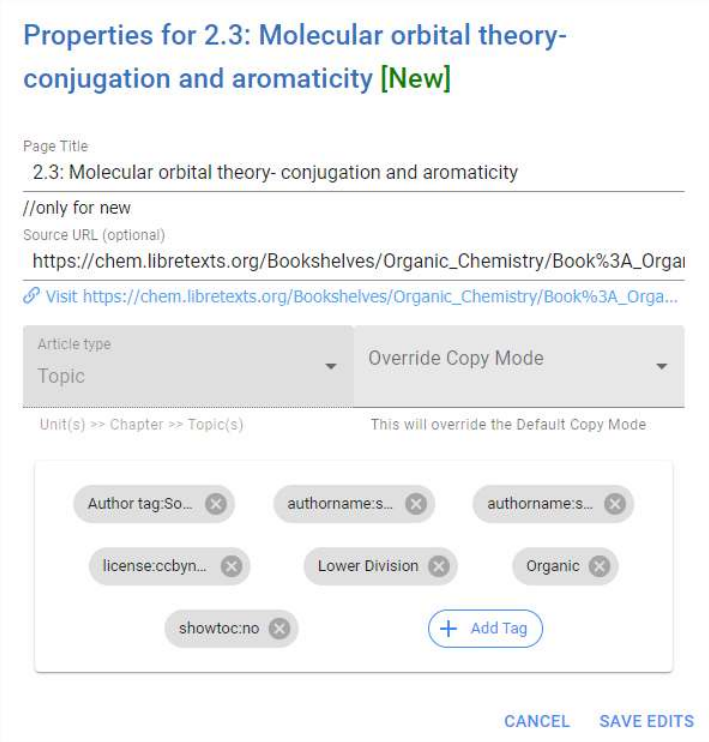


Figure 7.3.9: Users can edit the page properties of any page in the Remix panel via the Page Properties section.

Publishing your Remix

When you are ready to publish your remix press the green "Publish" button (Figure 7.3.8). You will then see an overview screen summary of your remix outlining the basic properties of the pages that will be created (Figure 7.3.10).

Step 6: *If you are happy with the summary, press "publish" at the bottom left to publish remixing map. You can follow the publishing process as your remix is being created in the right panel. When it is all done click the link at the bottom of the right panel.*

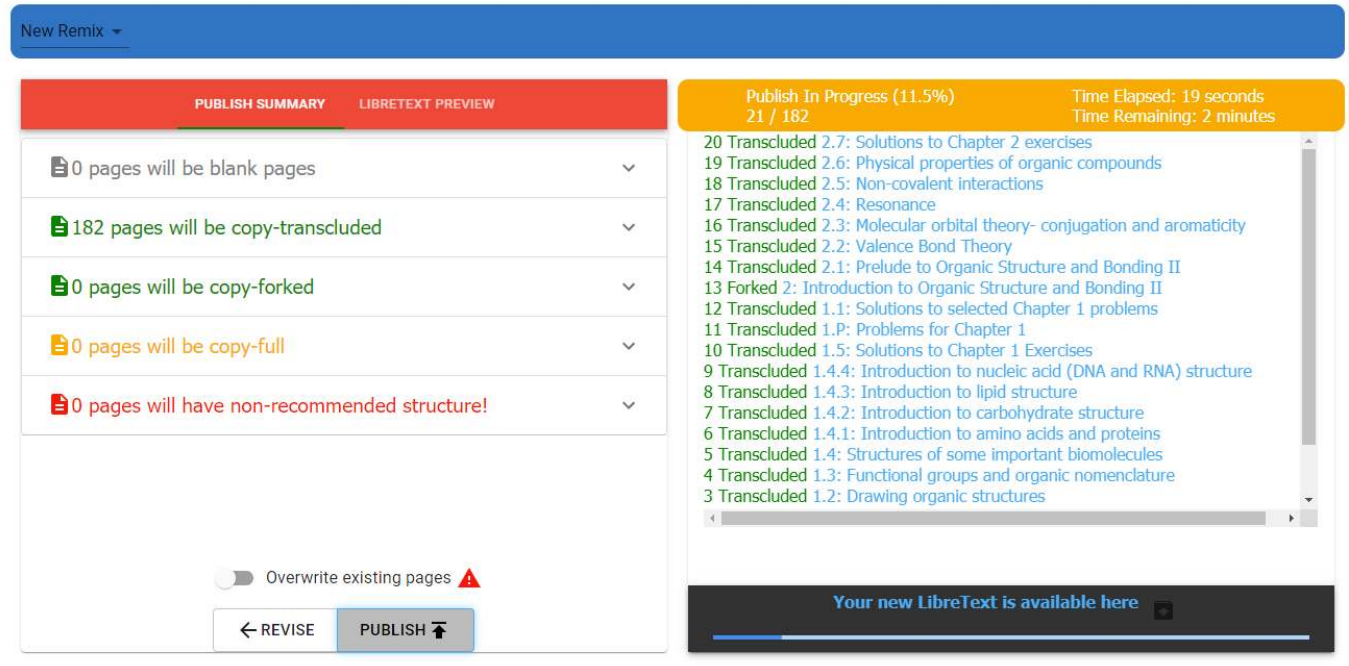


Figure 7.3.10: Users can edit the page properties of any page in the Remix panel via the Page Properties section (left). Once pressed, the map then is created and progress can be viewed via the right panel.

Take Ownership of your Remix

New remixes will automatically be placed in your Sandbox.

Step 7: *Click on the blue text in the lower right, "Your new LibreTexts is available here". This will open up the newly published Remix in your Sandbox.*

Edit Remix

It is important to note that while the remixer is a powerful tool for combining existing content in the desired organization, typically further editing is desired at the paragraph/sentence level within the pages. This requires direct editing of the pages of the newly publish Remix using the procedures outlined in Chapter 3 and Chapter 4.

Step 8: *Edit/curate remix as needed by manually editing individual pages.*

Reremixing the Remixer

Often, it is desired to reorganize existing remixes or to add or delete content in the remixes. To do that, the re-remixer mode should be used. Before going to the re-remixer you should move to the book you want re-remix on a tab in your browser and invoke the Remixer from there.

Step 9: *Switch to Reremix mode by clicking on the "New Remix" button on the left edge of the blue bar (Figure 7.3.11) and changing this to "Edit Remix".*

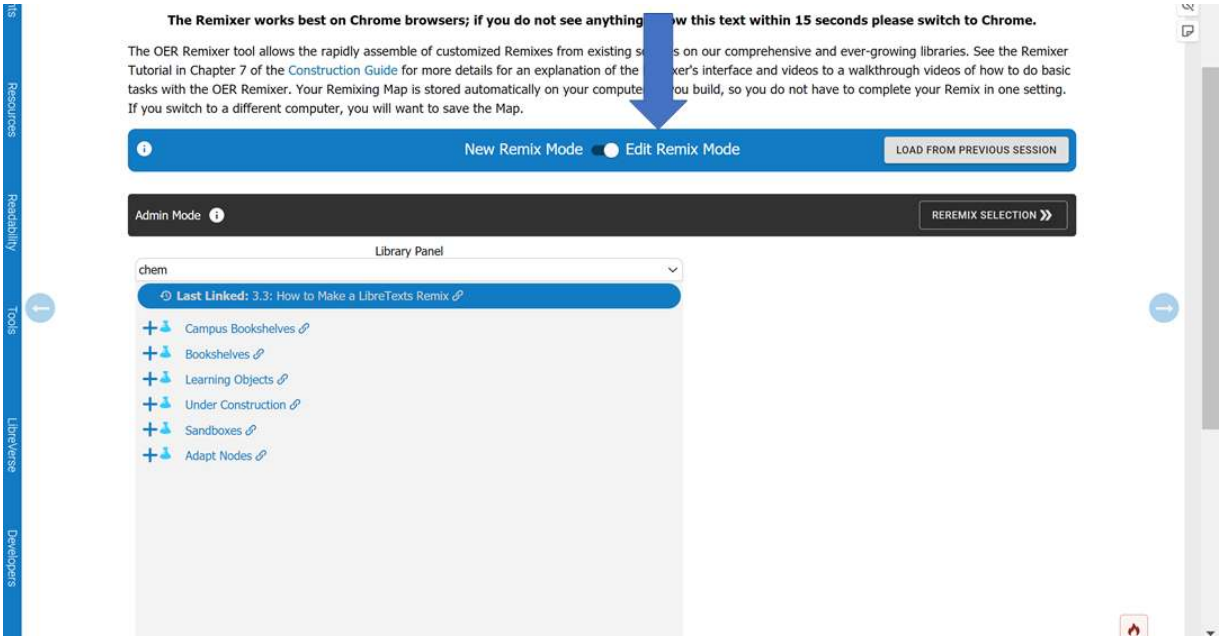


Figure 7.3.11: How to switch to Reremixer mode ("Edit Remix").

Once the Remixer is in the Reremix mode, the /text you went to the browser from is displayed at the top of the Library Panel. You can also select the text you want to edit by exploring the library hierarchy in the Library Panel (Figure 7.3.11). Click on the Last Linked line or the selected text and then click the "Reremix Selection" button in upper right corner. Except for Developers and Administrators users can ONLY re-remix texts in their own personal sandboxes or texts on campus bookshelves for which they have permission (usually only the ones that they have created)

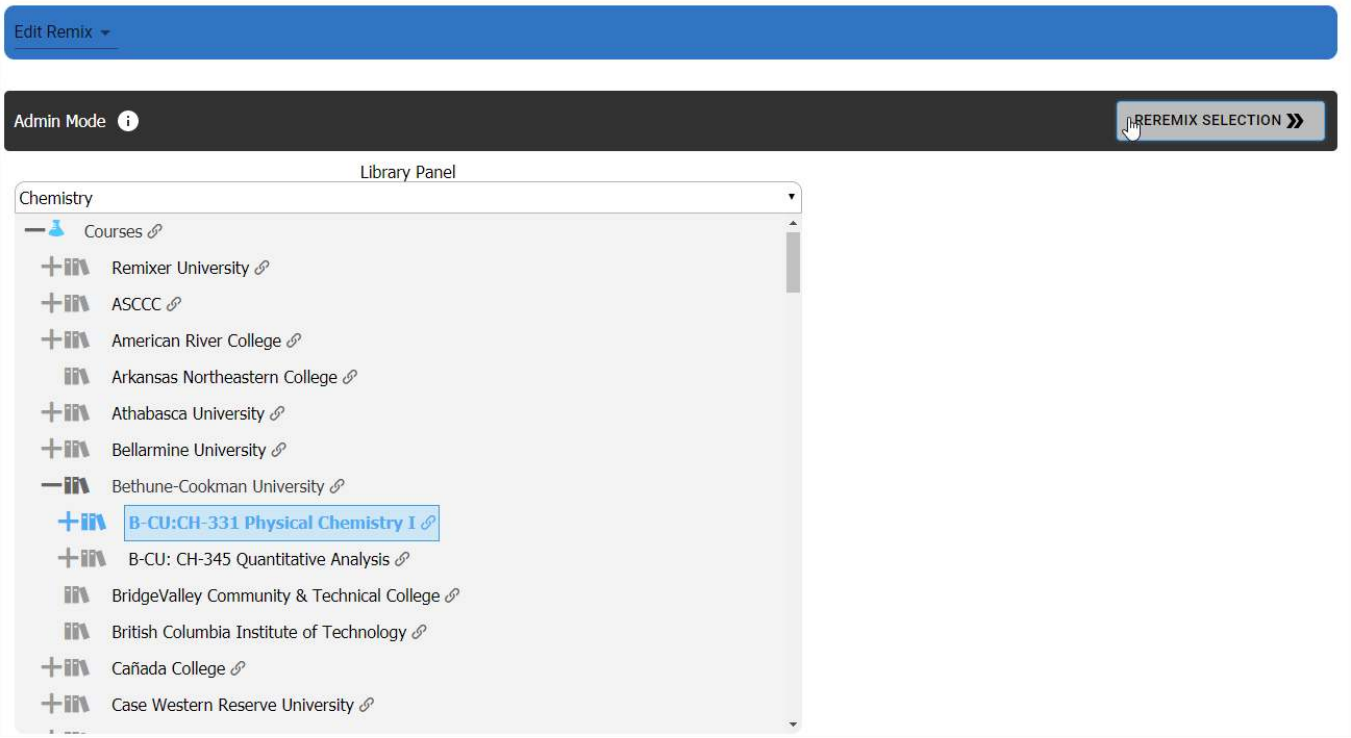


Figure 7.3.12: How to switch to Reremixer mode ("Edit Remix")

Once the remix is generated, it pulls up in the Remix Panel just like **Step 4**. The main difference here is that the Remix already exists. The remix can be reorganized with pages added and deleted just like in the Remixer mode. However, in contrast to the Remixer mode, different colors can be found depending on if a new page is created (green), or if a page title is changed (orange) - often via the autonumberer - or if a page is deleted (red) (Figure 7.3.13). Users can also pull content from the Library and add to the Remix panel as desired.

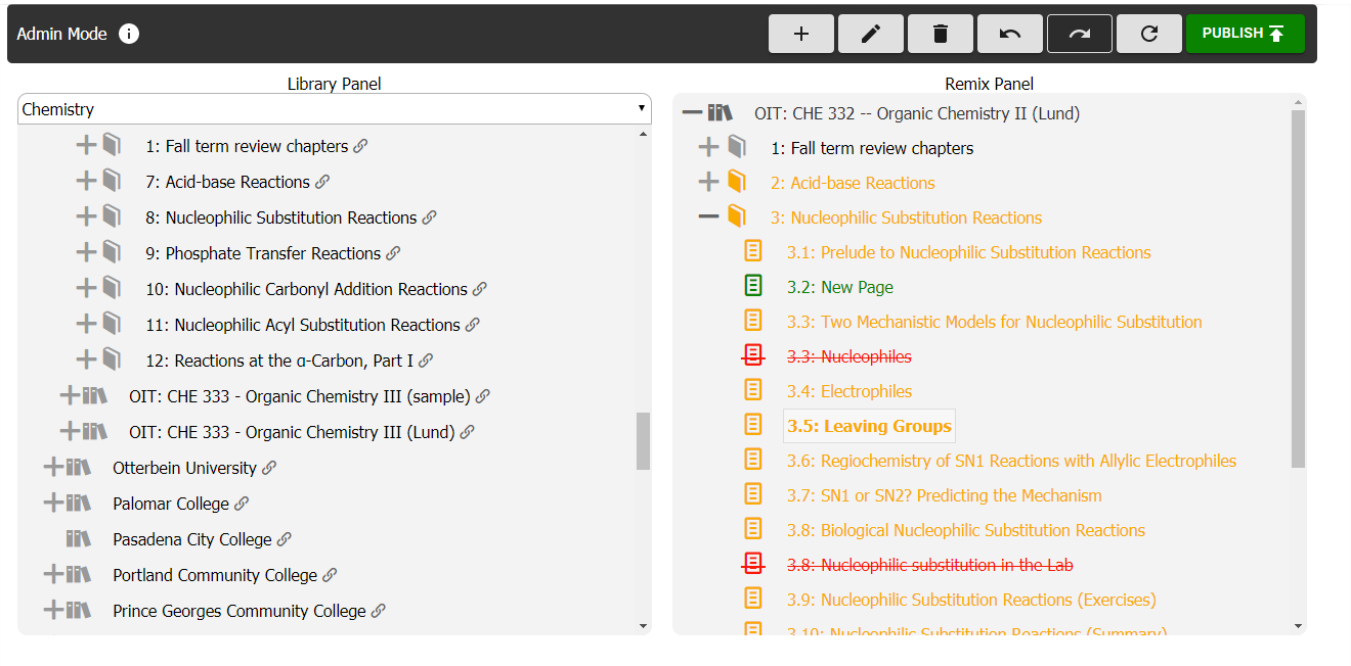


Figure 7.3.13: Edited remix showing deleted pages in red, new page (in green) and modified pages (in orange). These changes only take effect once the remix is "published"

Step 10: *Reremix the previously published remix from Step 7 as needed.*

The remixed text can be published following the instructions in ***Step 6*** (clicking the Publish button). The only difference is that the Publish Summary differs AND if the reremix modifies or deletes any pages, it cannot be published without requiring the user to flip the switch titled ("Overwrite existing pages). Then the changes are enacted.

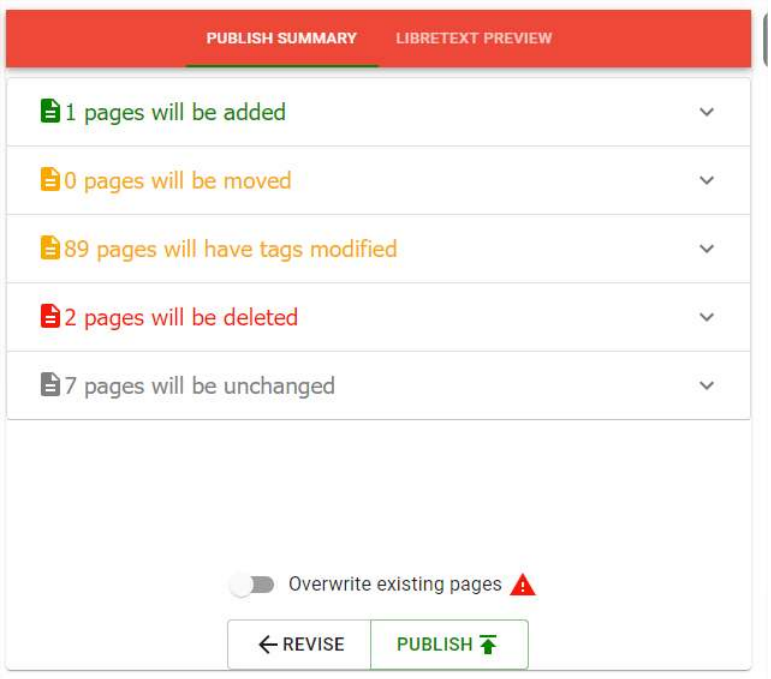


Figure 7.3.14: The Publish Summary for the Reremixer mode is slightly different than the Remixer mode (Figure 7.3.10) with a summary of the number of new, modified and deleted pages that will take effect once the text is published.

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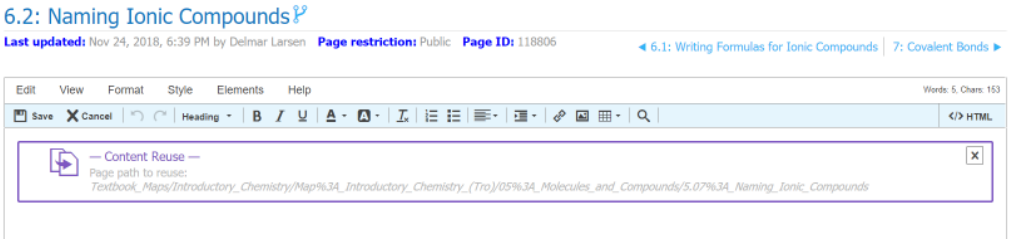
7.4: Copy-Transcluded and Copy-Forked Remixes

The Remixer generates "transcluded" pages that mirror the original primary content. To edit the content on the new Remixed page, authors have to either edit the original material (e.g. with errors) or have to "fork" the page to copy the content from the original master page into the the new Remixed page.

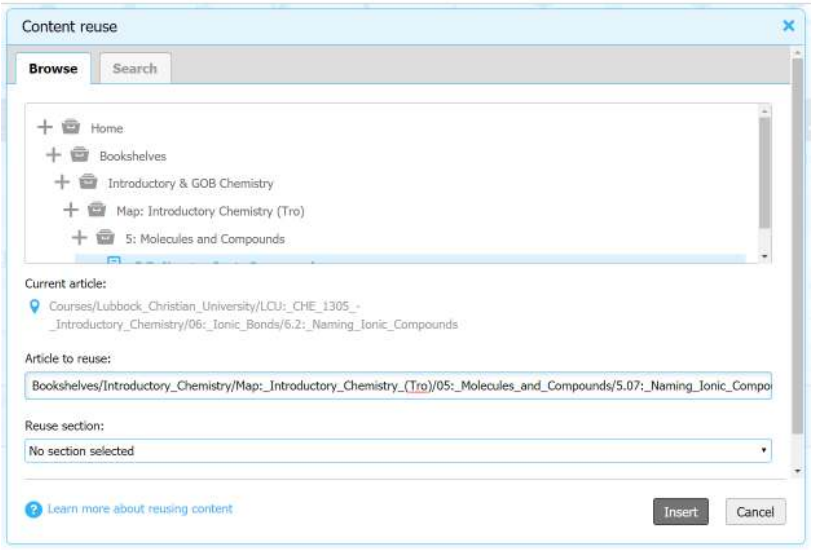
When and How to Edit Original Page

Except for pages that you created only administrators and developers can edit the original pages on the Bookshelves or Campus Bookshelves without special permission. If you spot an error that needs to be corrected or believe that the text in the original page can be improved please contact info@libretexts.org first for permission to edit the original page to fix mistakes, improve language, fix formatting, or other things that don't change the meaning or flow of the original page. Remember, others may have remixed from those pages and if they are changed their text will also change.

If you have permission, to edit the original page, first edit the transcluded page and you will see a screen like this:



Double click on the "Content Reuse" box so this box pops up:

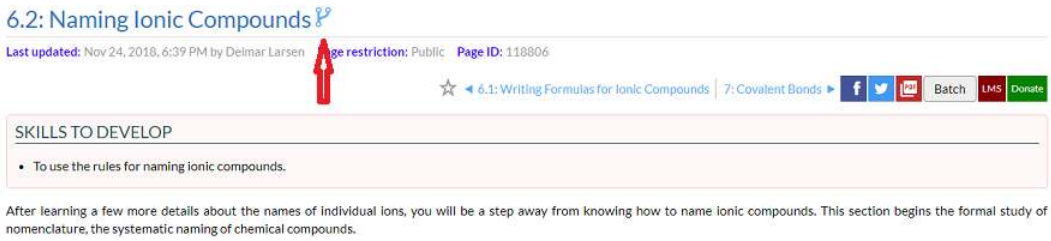


Copy the link in the box "Article to reuse" and paste it into the browser address bar. You can now edit the original page. Use the browser's back button to get back to your remix when you are done.

When and How to Create a Copy of the Original Page to Edit

If you are altering the content of the original page to fit into a different flow than the original book, changing the pedagogy of how the material is presented, deleting subsections, or otherwise majorly modifying the original, you will want to "fork" the original page. Forking a page creates a copy of the original page in the new location that is completely independent of the original and you can edit it as you see fit (without affecting the original source page).

The easiest way to do this is with the "Forker" which works automatically by pressing the icon next to the remixed (and transcluded page). Then authors can edit the remixed pages without affecting any other page on the platform. The downside is that any upgrades to the Master content will not be reflected in these forked pages.



How to Deal With Attributions on Forked Pages

Under Construction

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7.5: Team Remixing

Team Sandboxes

The facilitate team collaborative efforts within the remixer was expanded to include Team Sandboxes. When set up by the LibreTexts administrators, team members, the sandbox area for individual users will be expanded with a shared Team Sandbox and look like this (with your username in the middle, not the "DelmarTestBasic" account):

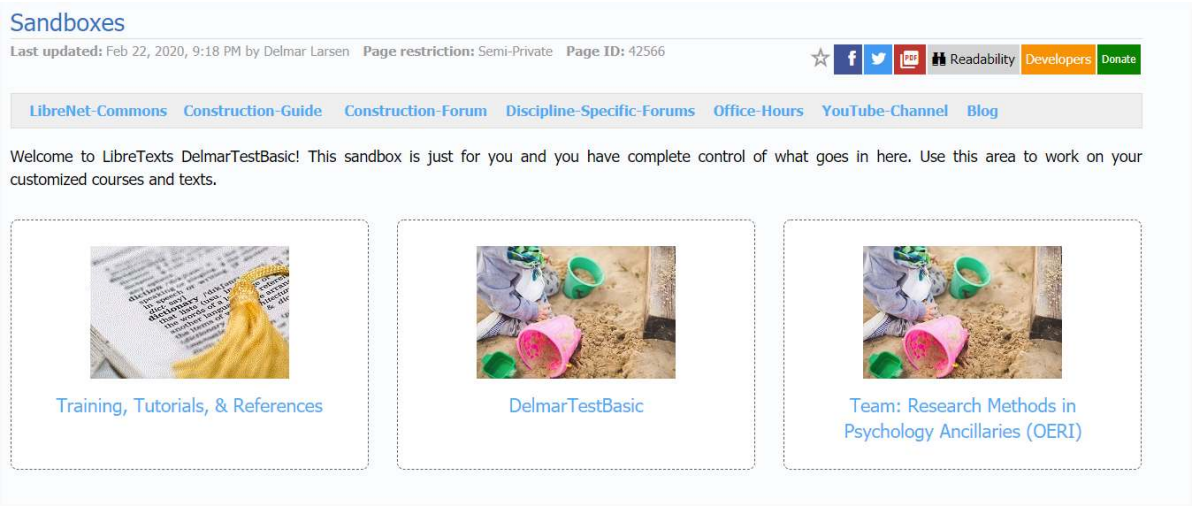


Figure 7.5.1: Sandbox area for a member of a Team.

Team members can collaboratively edit content in th Team Sandbox, including using collaborative remixer.

Refresh Remixer may be Needed

To clear the cache and update the remixer on your computer, you will have to do a Control-F5 - for PCs and Ctrl and ⇧ Shift and then press R for macs.

Collaborative Remixing

The remixer (in edit remix mode) can access to the entire library in the "Library Panel" including texts in the Courses, Bookshelves and Sandboxes (Figure 7.5.2). A new feature that is the text that was open when the remixer was launched is indicated in italics; the remixer in Figure 7.5.2 was loaded from the Sandbox area.

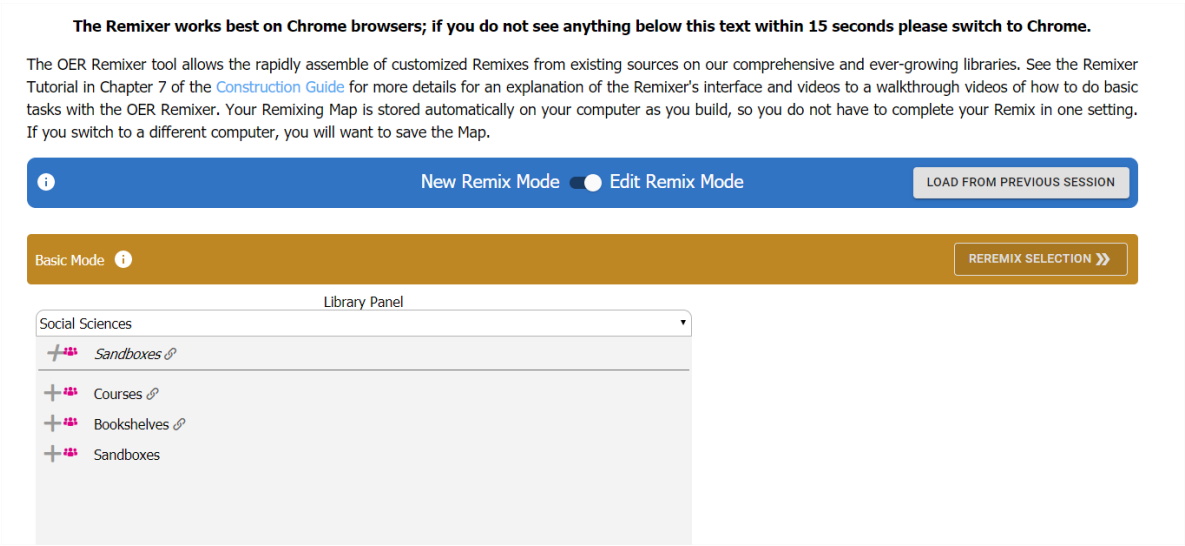


Figure 7.5.2: Remixer, just loaded with library hierarchy collapsed

When the hierarchy in the the Library Panel is expanded, only sections that are in blue text can be loaded with your permissions.

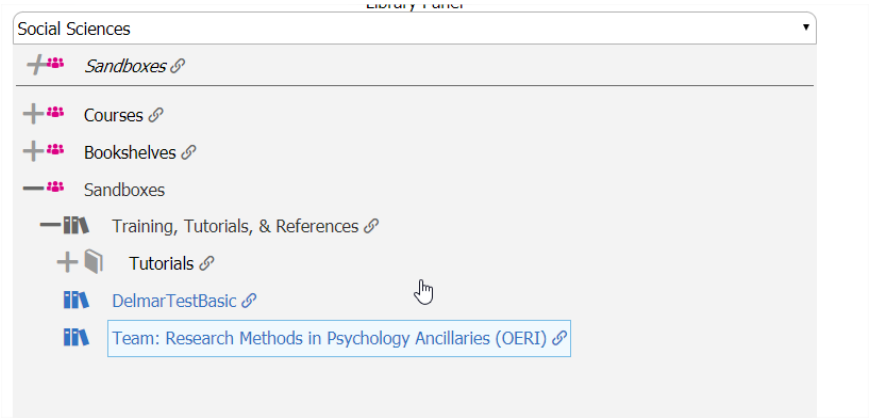


Figure 7.5.3: Remixer with sandbox hierarchy expanded. This user only has permissions to load content in the "DelmarTestBasic" and "Team: Research Methods..." sandboxes.

There are no texts/courses to remixer in either Sandbox, so nothing can be loaded up. That requires creating a new remix, or manually adding an empty page in the sandboxes for expanding. The remixer (new mode) will be updated promptly for doing this.

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CHAPTER OVERVIEW

8: Disseminating Texts and Course Shells

You can of course use the LibreTexts directly from the website but if you wish to integrate into a LMS or provide physical books that is also possible.

8.1: Importing LibreTexts into a LMS

8.2: How to Publish to Lulu xPress

8.3: Everything PDF

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8.1: Importing LibreTexts into a LMS

Currently, LibreTexts can be imported into a Learning Management System (LMS) using Common Cartridges v1.1. Once you've identified a LibreText to bring into your LMS, the process is quite quick and consists of the following steps:

1. Downloading the Common Cartridge file
2. Importing the Common Cartridge file into your LMS

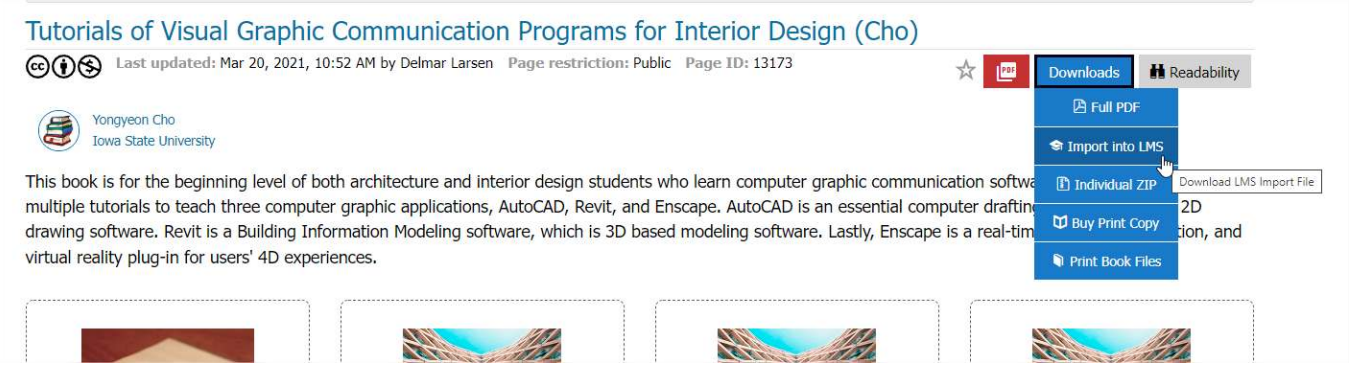
Instructions for downloading the Common Cartridge file

This procedure is used to import a LibreTexts into your Learning Management System (LMS) as a set of links.

- If the LibreText you want has Downloads in the upper right corner of the cover page, you can use the Downloads Dropdown.
- If you want to peruse our full collection of complete LibreTexts, try out our LibreTexts Commons
- If neither of these options are available on the content you want, please get in contact with us at info@libretexts.org to see when that LibreTexts may be available in the downloads center.

Downloads Dropdown

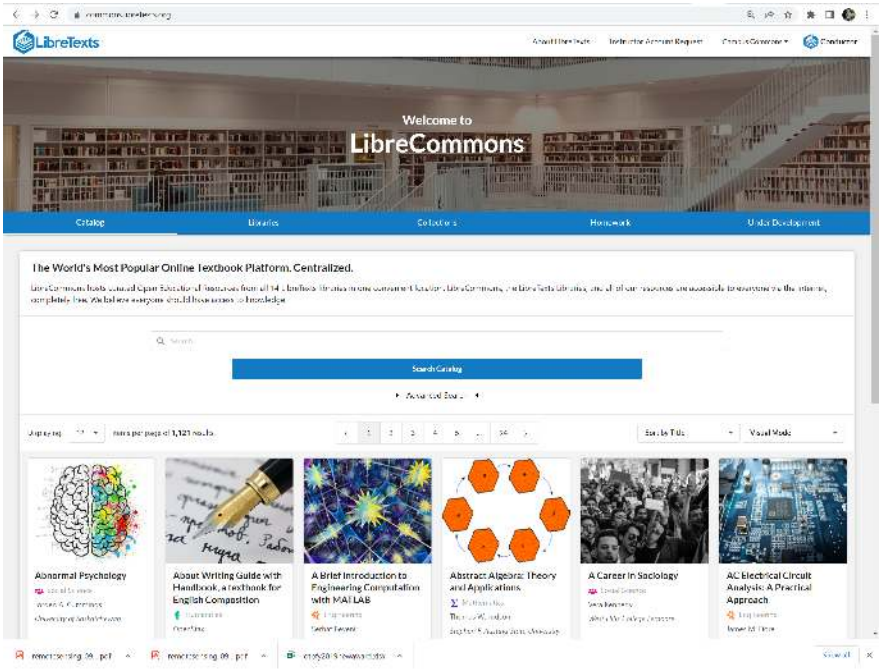
The *Downloads* Dropdown is present on the front page of most courses to provide easy access to popular download formats. If this blue *Downloads* button is present in the upper right corner of your LibreText front page, use this method.



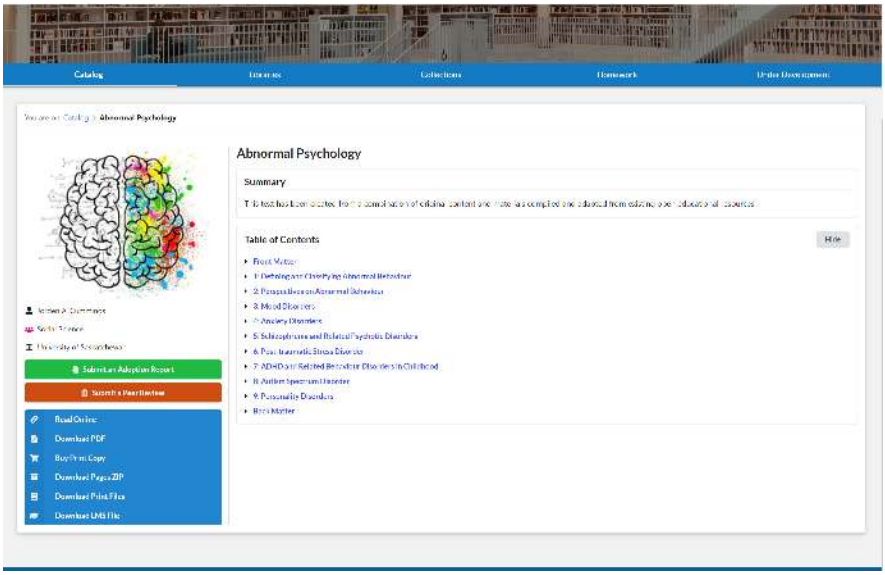
1. Hover over the blue *Downloads* button. A dropdown menu should appear with a few download formats.
2. Click on *Import into LMS*. You will be prompted to save the file LibreTexts.imscc to your computer.
3. Make sure to save the .imscc file in a place that you will remember for later steps. If you would like, feel free to rename the file.
4. Finally, move on to our section on Importing this file into your LMS.

Download Method 2: LibreTexts Commons

LibreTexts Commons has a collection of almost all of the LibreTexts in each library.



1. Find the LibreText you want, either by using the search bar or by scrolling through our collection.
2. Double Click on the book you need to bring into your LMS.



1. Click on *Download LMS File*. You will be prompted to save the file LibreTexts.imscc to your computer.
2. Make sure to save the .imscc file in a place that you will remember for later steps. If you would like, feel free to rename the file.
3. Finally, move on to our section on Importing this file into your LMS.

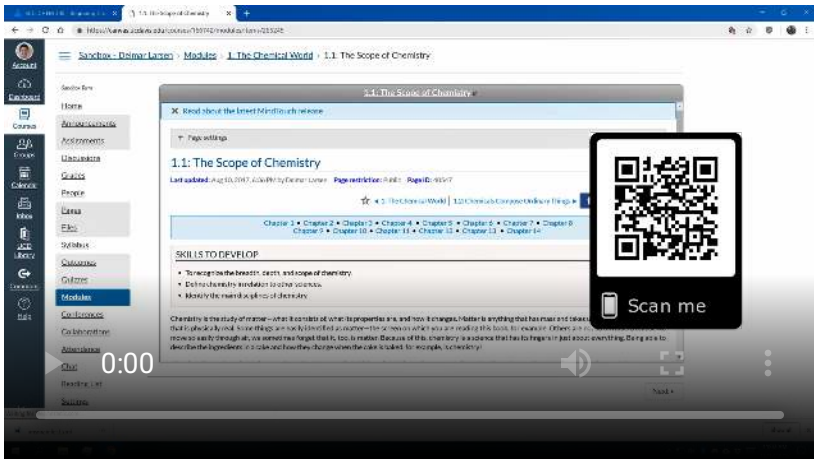
Instructions for importing into your LMS

Almost all LMS support importing using the IMS Common Cartridge format. We have listed instructions for some of the most popular LMS below.

1. Canvas
2. Moodle
3. D2L

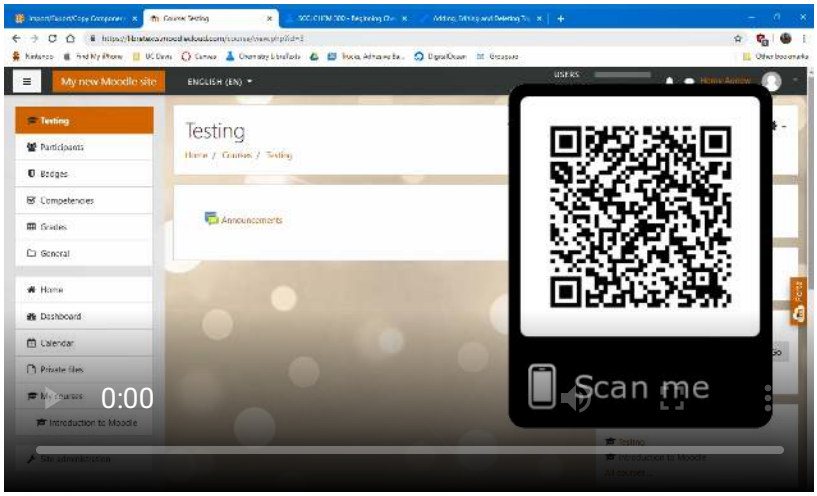
Blackboard also supports the Common Cartridge v1.1 specification for course imports but you may have to give the imscc file to your campus Blackboard administrator for them to set up the files for your courses. If they have problems write to info@libretexts.org and we will link them to those who have done this.

Importing into Canvas



1. Go to your course in canvas.
2. Go to **settings** on the left side of the course pane.
3. Go to Import Course Content on the right side of the course pane.
4. Set the Content Type as a *Common Cartridge 1.x Package*.
5. For source, select the Common Cartridge (.imscc) [in the video called imsmanifest.xml] file that you downloaded previously.
6. Select *All Content*.
7. Click Import!
8. Wait for the loading bar to finish.
9. You content is now available in modules!

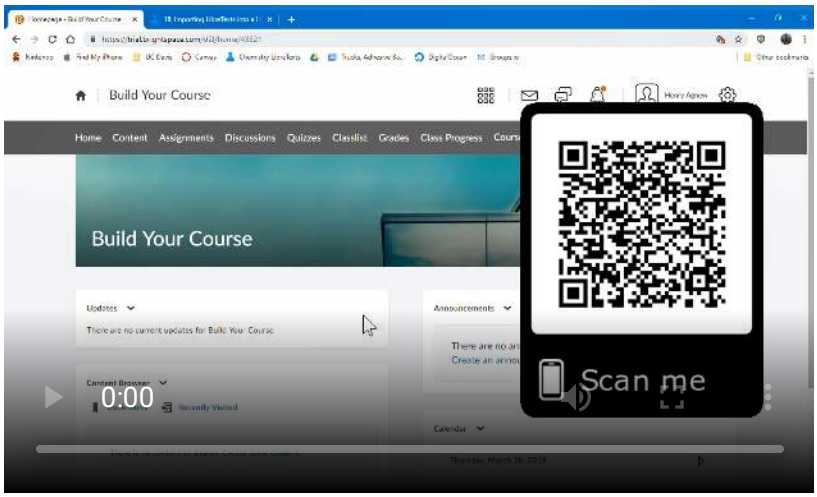
Importing into Moodle



1. Navigate to your course in Moodle.
2. Click on the gear in the upper right of the page.
3. Click Restore.
4. You will be taken to the course page. *Choose a file.*
    1. Use the File picker to select your previously downloaded Common Cartridge (.imscc) file.
5. Click Restore.

6. On the backup details page, click *Continue*.
7. You will most likely use *Restore into this course*, but you can instead Restore as a new course if desired.
    1. If you are restoring into this course, you have the option to *Merge the backup* or to *Delete the contents*. Pick which option you want before continuing.
8. Click Continue. There are multiple on the page, so click the one corresponding to the Restore option you are choosing.
9. On the next screen, click *Next*.
10. On this Schema screen, you have an opportunity to look at the content that is going to be imported as well as to chose any content that you want excluded. At the bottom of the page, click *Next* when done.
11. This is the review screen. Make sure everything is as you expect it to be. At the bottom of the page, click *Next* when done.
12. The import should process, and you will have the option to return to the course homepage to see your new content!

Importing into D2L



1. On your course homepage, click the gear in the upper right corner.
2. Click *Import/Export/Copy Components.*
3. Click *Import Components* and then click *Start.*
4. Use the Upload button and select the Common Cartridge (.imscc) file that you downloaded earlier.
5. Click *Advanced Options*. It is NOT recommended to use *Import All Components* as it double imports the sections.
6. After the file upload completes, you will be prompted to continue and will wait for a brief moment as the file is read. Click *Continue* again.
7. On the Customize Your Course Package, click *Select All Components* and then tick *Select individual items to import.* Click *Continue* at the bottom of the page.
8. On this page, you must tick only the Chapters. For an unknown reason, D2L makes a bunch of duplicate sections that should be excluded from the import. Chapters are most easily identified by the lack of a section number. When finished, click *Continue* at the bottom of the page.
9. You will be taken to a final page to review your selection. When you are content with your selection, click *Continue* at the bottom of the page to finish the import.
10. Please wait as the import processes. You should be redirected back to your course with the new modules on the left sidebar!

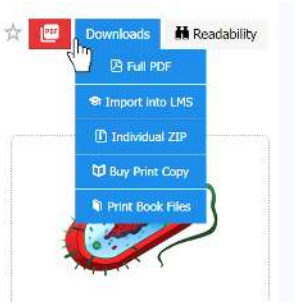
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8.2: How to Publish to Lulu xPress

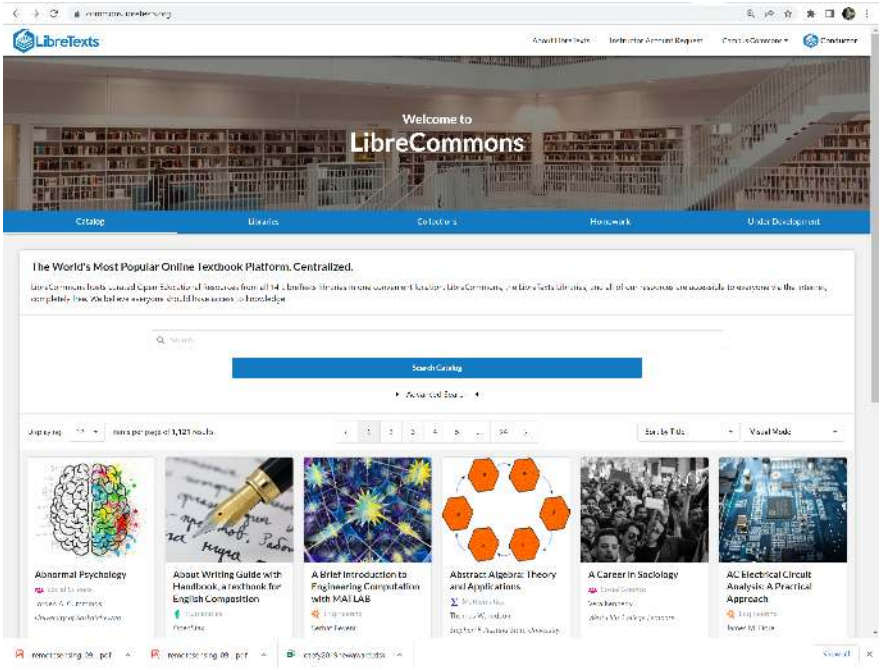
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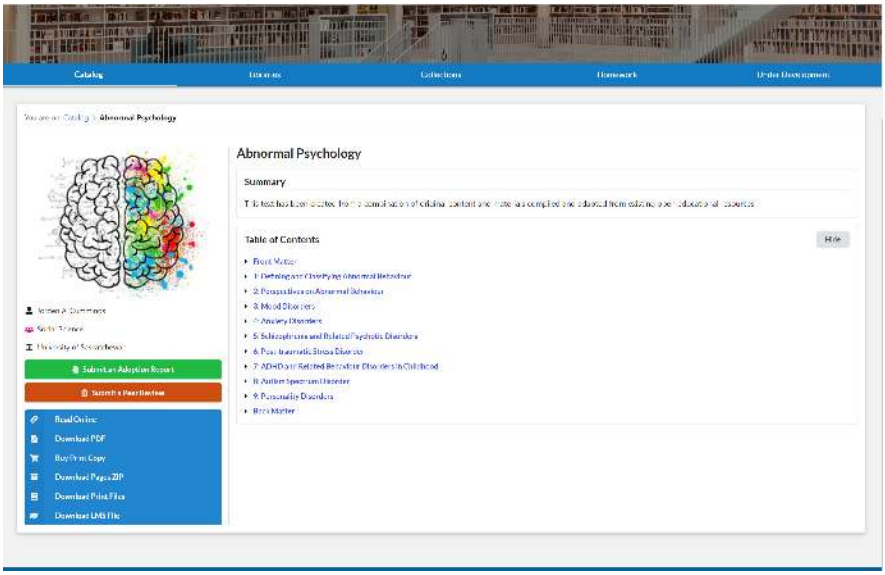
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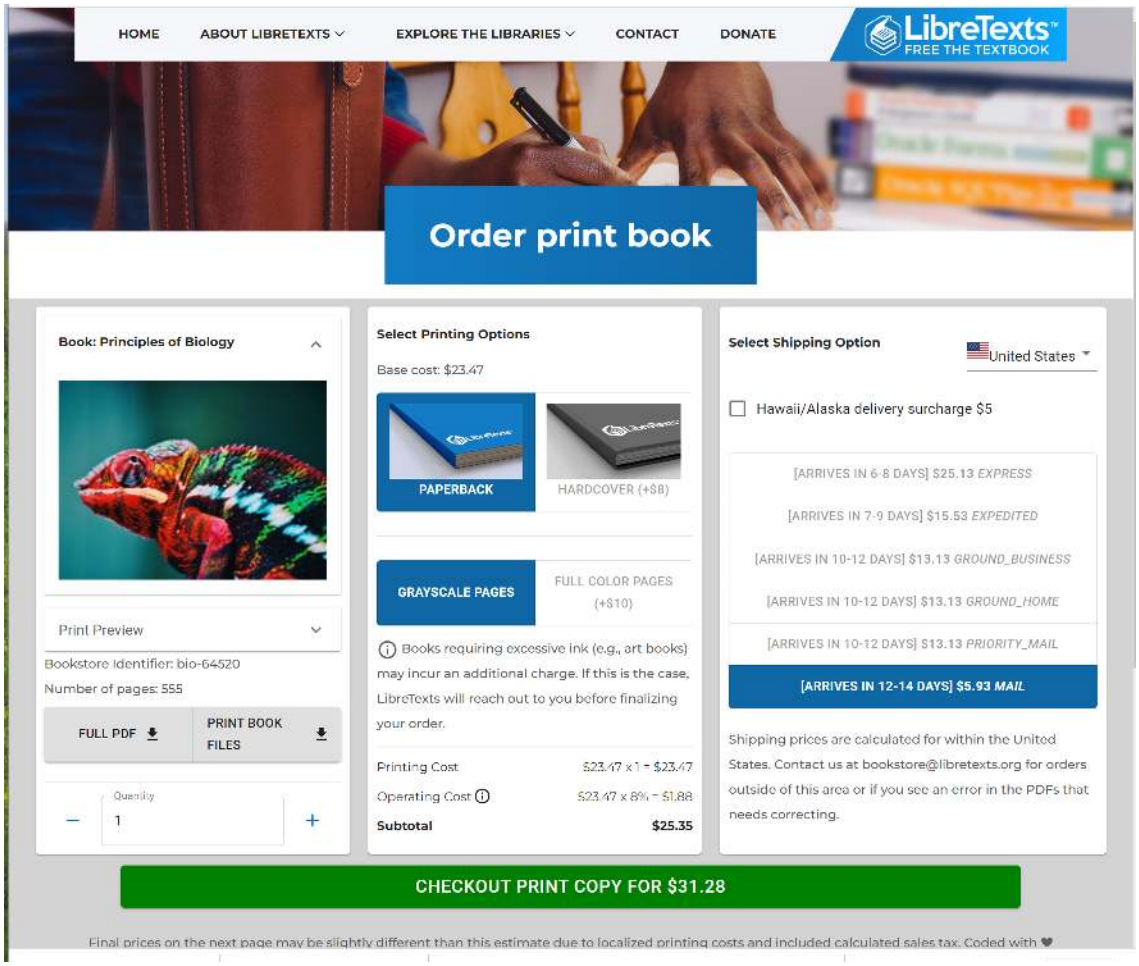
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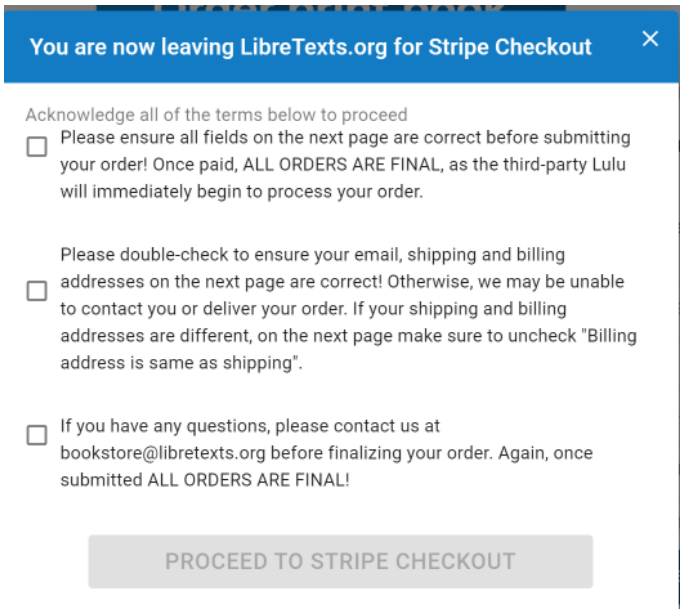
and then select the Buy Print Copy button in the blue menu at the bottom left. This brings up the LibreTexts Bookstore



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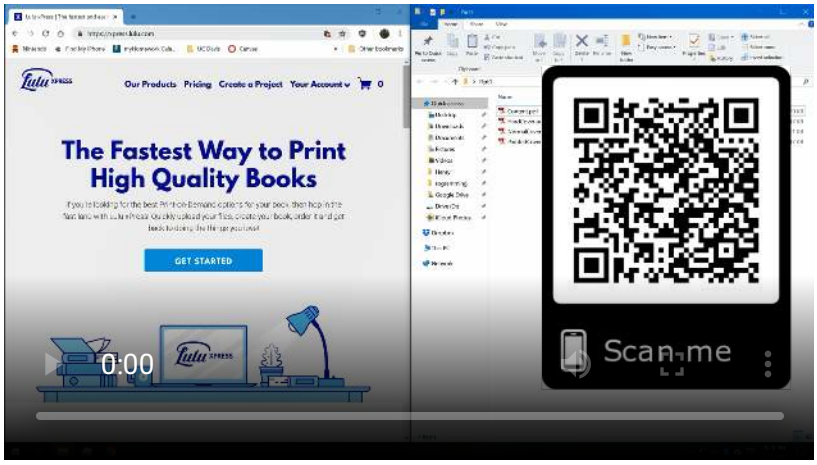


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1. Click on *Print Book Files* in order to download Publication.zip.
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2. Once logged in, click *Get Started* or *Your Account* > *Projects* > *Start New Project to begin!*
3. On your computer, unzip the Publication zip file that you have previously downloaded.

4. It is highly recommended to skim through all of the PDFs within the Publication zip file for any errors. These files are automatically generated, so please contact us at info@libretexts.org if you encounter any problems!
5. Enter a book title.
6. For the Upload Interior file section, upload the Contents.pdf file within the unzipped Publication folder. This should take a while depending on the size of the textbook.
7. Pick your Interior Color and Paper type. This can be easily changed later since these options affect the cost.
8. Select a Binding type. Perfect Bound is softcover/paperback while Casewrap is hardcover.
9. Choose a cover finish.
10. At this point, the cost estimator will activate. Feel free to try different combinations of these options to balance the cost.
11. The next step is to upload the cover. Make sure to pick the cover that corresponds to the Binding type such as casewrap or perfect bound!
    1. If you go back and change the binding type, you will need to reupload the matching cover!
12. Lastly, a preview will load at the bottom for you to take a look at. This will take a few minutes, so maybe this is a good time to refill your coffee!
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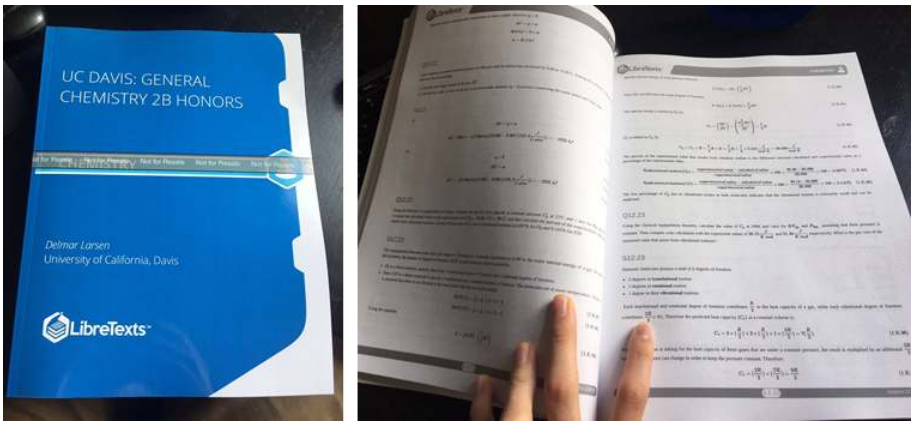
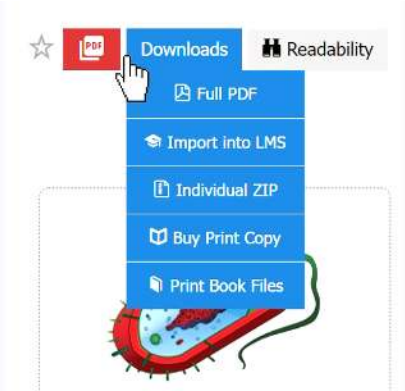


Figure 8.2.1: Physical copies of LibreTexts Remixes.

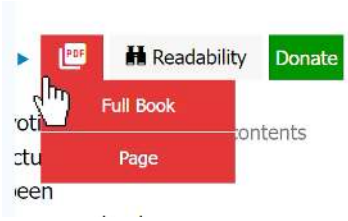
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CHAPTER OVERVIEW

9: ADAPT Homework System

The ADAPT homework system is a multifaceted online assessment infrastructure to accompany LibreTexts books and provide a wide range of questioning options. A video playlist is available on the LibreTexts YouTube Channel.

9.1: ADAPT Account Types
9.2: Creating and Importing Existing Courses (Course View)
9.3: Adding New Assignments
9.4: Adding New Assessments
9.5: Assignment Control Panel
9.6: Grading Open-Ended Assessments
9.7: Embedding Summative ADAPT Assessments into Textbook
9.8: Interfacing ADAPT to LMS via LTI

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9.1: ADAPT Account Types

Adapt currently had three account types: (1) instructors, (2) graders, and (3) students. Below outlines how these accounts are created.

Instructor Accounts

Main Features:

- Make courses and assignments
- Add assessments to assignments
- Set and edit course preferences
- Grade assignments
- Add Graders and give access to assignments

How to access: Instructor account access code. Contact the LibreTexts development team for access (info@libretexts.org).

Creating Instructor Account

1. Go to https://adapt.libretexts.org/
2. Click "Register" in the top right corner
3. Select "Instructor" from the drop-down menu
4. Fill out your name, email, your unique access code, create password and choose your time zone from the drop-down menu
   Note: Please contact Delmar Larsen to obtain your instructor account access code.
5. Click "Submit"

Grader Accounts

Grader accounts are designed to facilitate streamlined open-ended grading. These accounts are designed to handle the grading of questions that autograding technologies are poorly crafted to address and require human review. Main features of this account is the abiility to

- grade assignments they are given access to
- provide students with feedback
- Answer students questions when contacted via ADAPT

Graders cannot make or edit assignments. Only instructor accounts have that ability.

How to access: Direct invitation from the instructor via ADAPT

Creating Grader Accounts

Instructors Instructions

1. Open Course Preferences

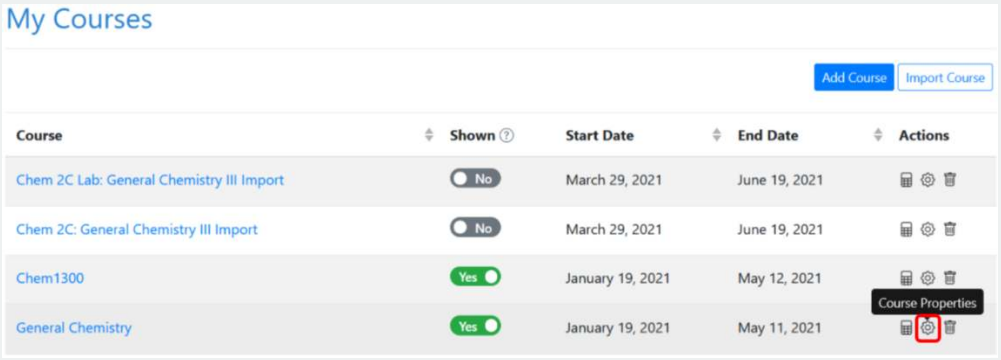


Figure 9.1.1: Use the gear icon to access Course Properties

2. Select "Graders" in the menu on the left
3. Click "Invite Grader"

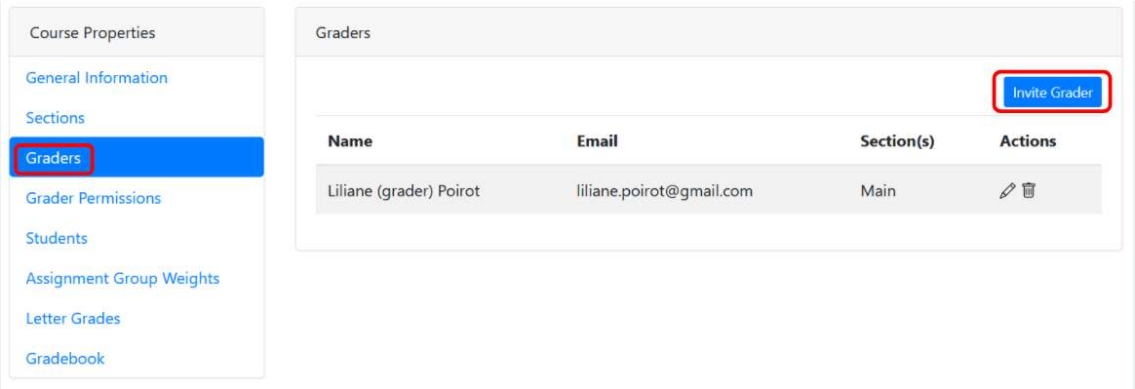


Figure 9.1.2: Select "Graders" in the menu on the left and then click "Invite Grader"

4. Enter Grader's email address
5. Choose sections to give Grader access to or click "select all" to give access to all sections
6. Click "Submit". Invited Grader will receive an email with the access code to join.

Graders Instructions

1. Open your invitation sent via email and copy access code

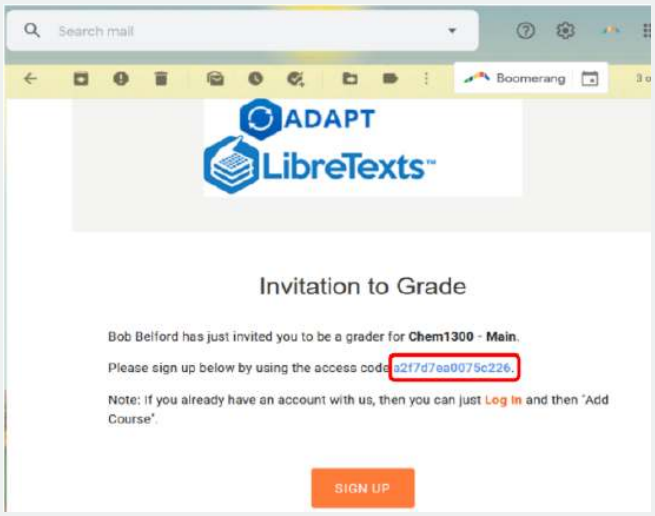


Figure 9.1.3: Copy the access code from the email

2. Go to https://adapt.libretexts.org
3. Click "Register" in the top right corner
4. Select "Grader" from the drop-down menu
   Note: if you already have a student or instructor account you will need to make a separate account to be a grader using another email
5. Fill out your information to make your account
6. After your account is created you will be brought to My Courses page
7. Click "Add Course"

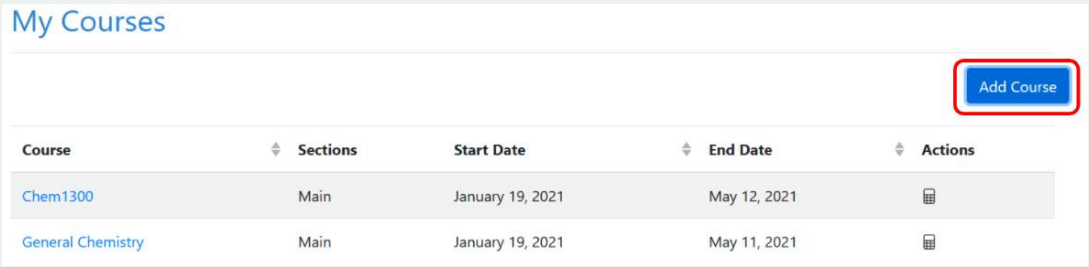


Figure 9.1.4: Click "Add Course" and paste the access code

8. Paste the Access Code you received via email
9. Click Submit

Grader Permissions

After the grader has made their account and registered, you can set permissions for which assignments they can access.
Under Course Properties select “Grader Permissions”. You can give grading access to individual assignments and graders, or you can select "give all graders access" to give all graders access to all assignments

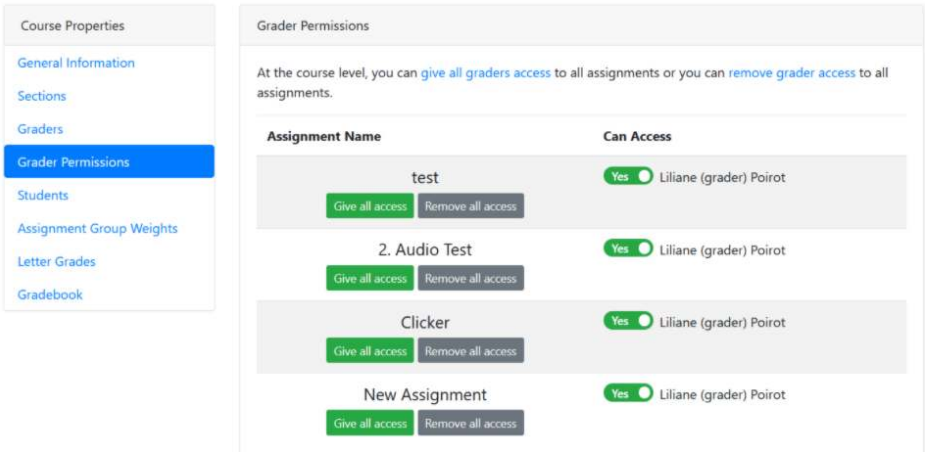


Figure 9.1.5: Use "Grader Permissions" to select which grader will have access to which assignments or give all graders access to all assignments

Student Account

Main Features:

- Join Courses
- View Assignments
- Submit Answers
- View grader's feedback
- Contact Grader

How to access: Access code distrbiuted the instructor.

Creating Student Accounts

Instructors Instructions

1. Open Course Preferences

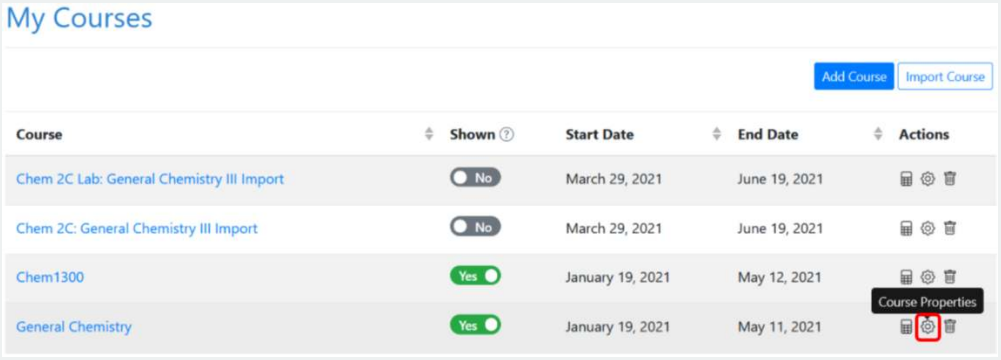


Figure 9.1.6: Use the gear icon to access Course Properties

2. Select "Sections" in the menu on the left
3. Copy access code.
   Note: each section will have a different access code

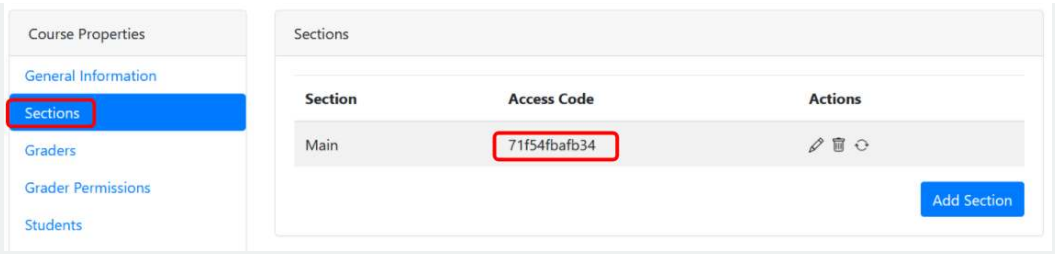


Figure 9.1.7: Copy the access code

4. Give this access code to the students

Students Instructions

1. Make sure you have an access code from your instructor. Each course and each section will have a different access code.
2. Go to https://adapt.libretexts.org
3. Click Register in the top right corner
4. Select "Student" from the drop-down menu
5. Fill out your information to make your account
6. After your account is created you will be brought to My Courses page.
7. Click "Enroll in Course"



Figure 9.1.8: Click "Enroll in Course" and paste the access code you received from your instructor

8. Paste the Access Code your instructor has provided
9. Click "Submit"

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9.2: Creating and Importing Existing Courses (Course View)

The ADAPT system allows for the creation of new courses and the reusing of existing courses (with permission of the author).

Creating New Courses

1. Log into your instructors account
2. Click Add Course

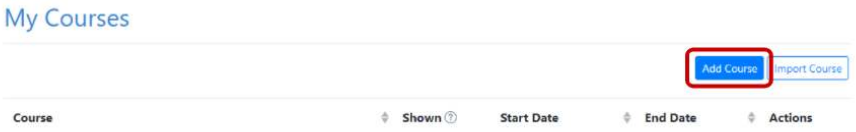


Figure 9.2.1: Add a new course to Adapt by clicking "Add Course"

3. Add the name, section, start and end dates and choose whether you want to make the course public or not. Click "Submit" Public courses are available for import by other instructors, private courses are only available for import by you.

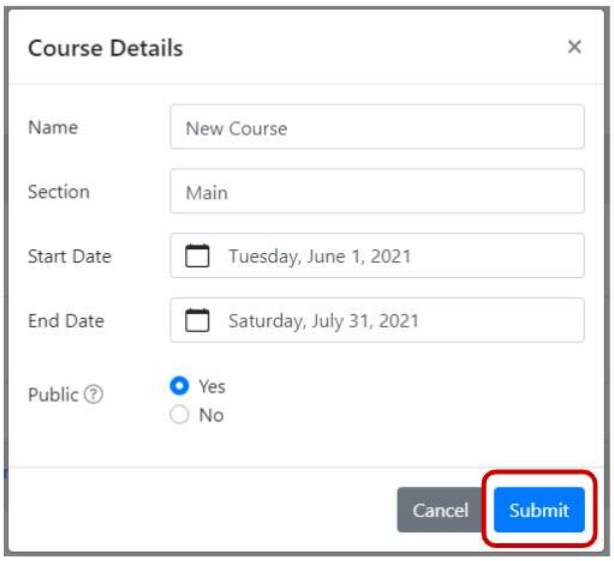


Figure 9.2.2: Add information about your new course and click "Submit"

Importing Existing Courses

Import Course option allows you to clone another course that was created by you or someone else. Gradebook and students' personal information will not be imported.

1. Log into your instructors account
2. Click Import Course

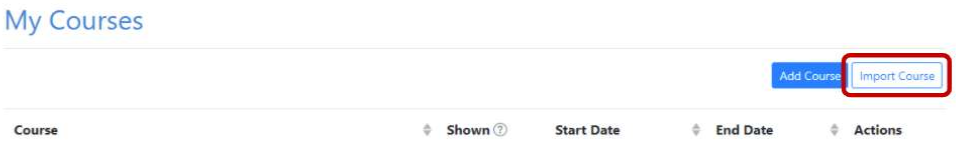


Figure 9.2.3: Import existing course by clicking "Import Course"

3. Start typing the name of the instructor or the name of the course that you want to import and select the course from the drop-down list.

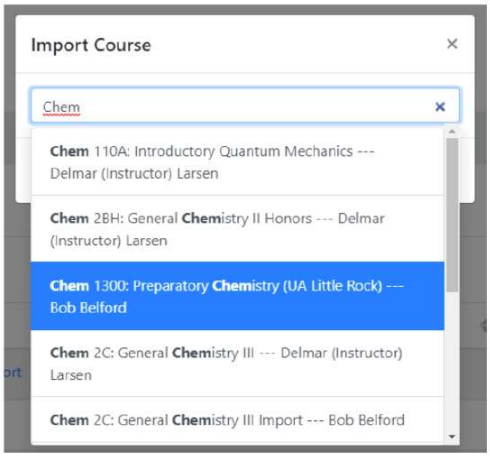


Figure 9.2.4: Choose the course that you want to import

4. Click “Yes, import course”

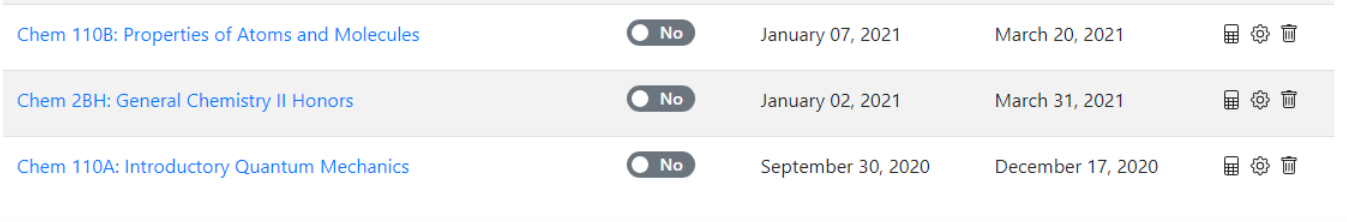
Note: Imported Courses are automatically set to Private. To allow other instructors to have access to the assignments of your newly important course, you have to select Public on the course properties page. Student information is **never** sharable.

Duplicating Courses

If you want to duplicate an existing course on your account, you need to "import" that course (from your account into your account).

Course View

The top level of the ADAPT is an overview of your courses that includes a link to access the course, a toggle switch to allow students to view the course (and its assignments and assessment), the course start and end date and some options.



Each course has three icons on the right side.

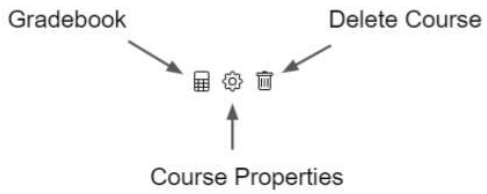


Figure 9.2.5: Course action icons

1. **Gradebook** - opens the gradebook associated with the course
2. **Delete Course** - deletes the course permanently
3. **Course Properties** - lets you access and edit course information, such as:

- Name
- Start and End dates
- Public/Private
- Add/Edit/Delete Sections
- Add/Delete Graders

- Delete Students or view the course as any of the registered students
- Set Assignment group weights
- Set Percent to letter grades conversion
- Course Gradebook

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9.3: Adding New Assignments

Add New Assignment

Assignments in Adapt normally consist of one or more assessments (questions). You can learn how to add assessments here (coming soon). To create a new assignment:

1. Log in to your instructors account and select the course that you want to add a new assignment to.
2. Click “New Assignment”

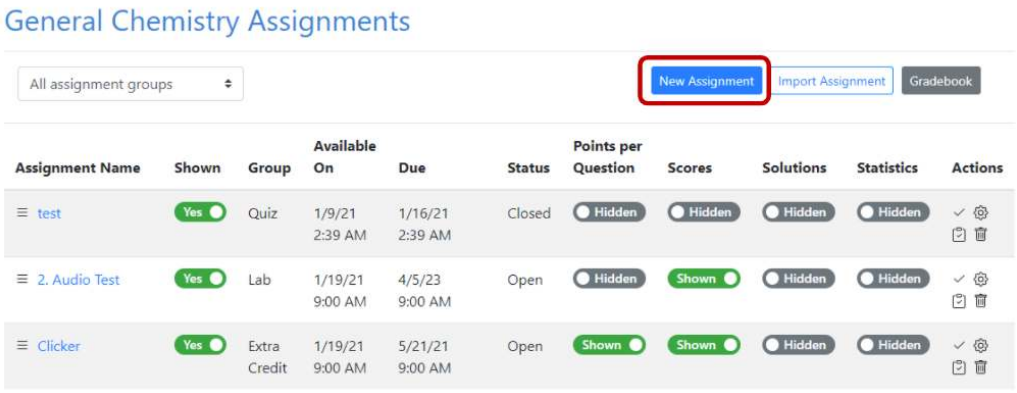


Figure 9.3.1: To add a new assignment click "New Assignment" button at the top

3. In the opened overlay window fill out assignment properties. Click “Submit” to save the assignment.

- **Name** - The name of the assignment that will be displayed for instructors and students
- **Assignment group** - You can choose an existing group or create a new group for this assignment.

  Note: you can assign Group score weights in Course Properties → Assignment Group Weights
- **Source**
  - Select “Internal” if you are using LibreTexts database or Query Library.
  - Select “External” if you are planning on adding/importing scores from another source manually.
- **Scoring Type**
  - Performance - students get credit for correct answers. Partial credit is possible with delayed grading.
  - Completion - with Real Time Grading, students get full credit for completing the assessment regardless of whether the answer they provided is correct. Open-ended questions are graded manually. If the assignment has both types of questions (open-ended and auto-graded) students will get full credit for auto-graded assessments and the open-ended questions will require manual grading.
- **Default Points/Question** will be applied to all questions by default, but can be changed for each question manually later on.
- **Assessment type**
  - Real Time - works best for auto-graded questions, students are provided with the feedback immediately after submitting their answer. Scores are also released at the time of submission.
  - Delayed Graded Assessments: this type will require manual grading. Students won’t get their scores and feedback until the scores are released.
  - Learning Tree Assessments: this type is only appropriate for learning trees.
  - Clicker Assessments: this type is only appropriate for clicker questions.
- **Default Open-ended Submission Type:**
  - Rich Text has additional formatting options compare to plain text
  - Plain Text has no additional formatting options available

- File - lets students upload submissions as PDF, TXT, PNG, JPEG, JPG
- Audio - this type of submission allows students to record audio as their answer and submit it. Note: Audio feedback from graders is also available (see tutorial for grading).
- None - students won't have any additional field for submission. Works well for auto-graded questions (H5P, WeBWorK, etc.)

- **Late Policy**
  - Do not accept late - once the deadline has passed students cannot submit their answers.
  - Accept but mark late - in this case the assignment will be marked late, but no points will automatically be deducted. You will need to set the final submission deadline before saving the settings.
  - Accept late with a deduction - The most flexible way to apply credit deduction. You can set deduction percent and choose whether you want it deducted once or periodically (i.e. every 10 minutes, 2 hours, 1 day).
- **Include in Final Score**
  - Include the assignment in computing a final weighted score - the score will be included in the final score calculation
  - Do not include the assignment in computing a final weighted score - the score will not be included in the final score
- **Instructions (Optional)** - these instructions will be shown to students before they see the first question of the assignment.
- **Randomization**
  - No - show all questions added to the assignment to students
  - Yes - only show a specific number of questions out of all questions you've added to this assignment. You will need to indicate the number of randomized assessments. The bigger the pool of questions, the greater the chance that all students will get a different set of randomized questions.
- **Notifications** - if students opted-in to receive notifications they will be notified if you select "Yes"
- **Assign to** - select one or several students, specific section or all students enrolled in this course
- **Available on** - date when the assignment will be first available to students
- **Due Date** - Deadline for the assignment
- **Final submission Deadline** - If you select "Accept but mark late" or "Accept late with a deduction" you will be asked to provide this deadline after which the submissions will not be accepted anymore.
- **Add Assign to** - use this option to assign special deadlines for a specific student/section

Import assignments

1. Log in to your instructors account and select the course that you want to add a new assignment to.
2. Click "Import Assignment".

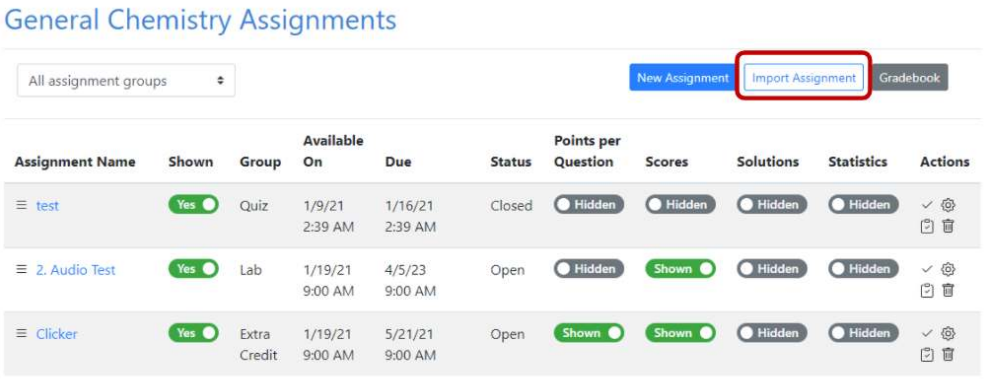


Figure 9.3.2: Click "Import Assignment" to clone properties or properties and questions from another assignment

3. You can choose to import **Just the properties** from another of your assignment (see the list above) and add different questions to it or import **Properties and questions** from one of your assignments.
4. Click "Yes, Import Assignment" to complete the import.

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9.4: Adding New Assessments

Once an assignment is created, instructors need to add assessments before students can use ADAPT. There are three approaches to address this: (1) adding via the Assignment Remixer, (2) adding via Meta-tag searches, and (3) direct adding via page ID codes.

Adapt Assignment Remixer

The Assignment Remixer is modeled after the OER Remixer on the LibreTexts libraries to faciliate easy drag and drop of assessments in an existing assignment.

1. Open the Assignment.
2. Click “Add Assessment”

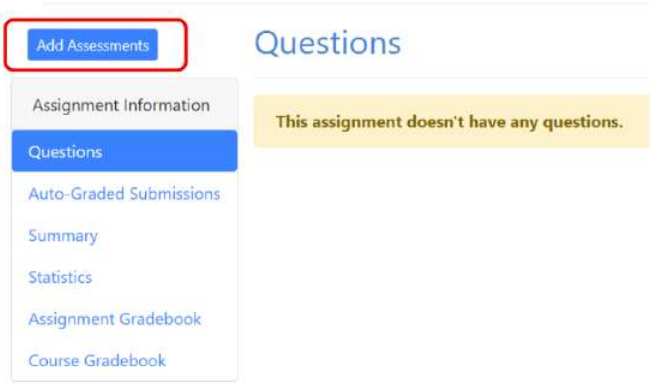


Figure 9.4.1: Add new assessments to the assignment by clicking on "Add Assessments" button

3. Open “Assignment Remixer” Tab
4. You can filter courses by School, Instructor's name, course name or all three
5. Select the assignment
6. Move questions from the left side of the screen to the right to add them to your assignment.

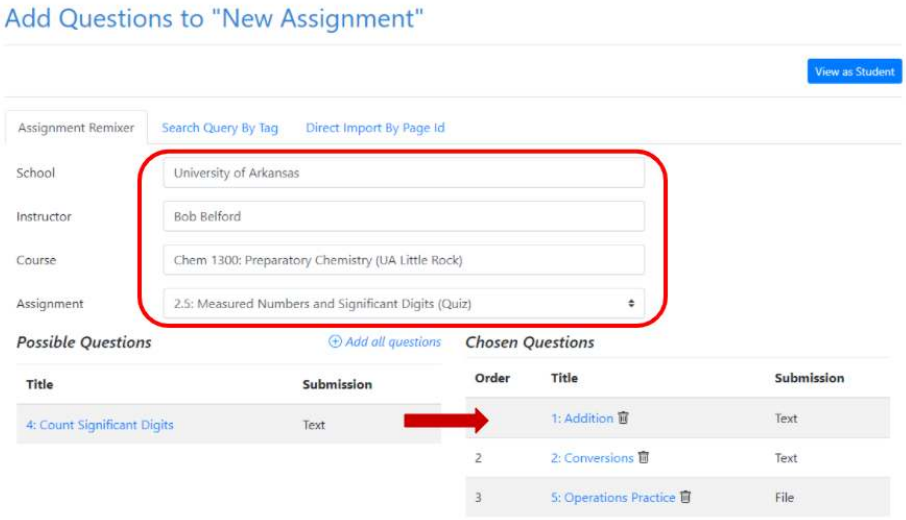


Figure 9.4.2: After selecting the assignment you want to copy assessments from, you can drag and drop the assessments to the left to add them to your assignment

7. You can preview any question by clicking on its name.
8. Click “Add all questions” if you want to add all listed questions
9. You can delete chosen questions by clicking on the Recycle Bin icon next to it

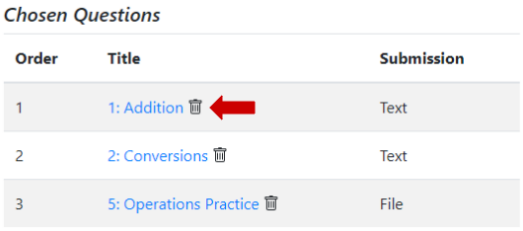


Figure 9.4.3: Delete questions by clicking on the Recycle Bin icon

10. You don't have to save your selection. Once you leave this page, all of the questions that you've selected will be added to your assignment.

Adding Assessments by Tag

An alternative way to add assessments to an assignment is to search for meta-information on the question, e.g., subject, author, key words, learning objectives etc. Build and aligning to tagging frameworks is still underway, so this feature has limited utility at this time.

You can add assessments from the Query Database using tags. To do that:

1. Open the Assignment.
2. Click "Add Assessments"
3. Open "Search Query by Tag" tab
4. Start typing the tag (you can use any word related to the questions you are looking for - topic, concept, etc.).

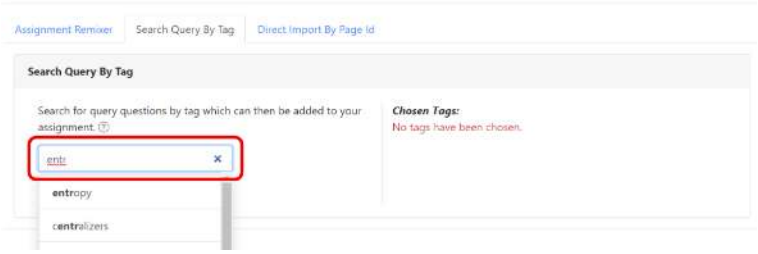


Figure 9.4.4: Start typing the tag to see all matching tags

5. Select the right tag from the drop-down list and click "Get Questions". The tag will be added to "Chosen Tags" section on the right. You can delete the tag by clicking on the recycle bin icon next to it
6. All questions that are currently in the Query that have that tag assigned to them will be shown below. You can go through all of them by clicking at the numbers and select the questions that you want. To add an assessment click "Add Question". If the question was added successfully you will see a confirmation message

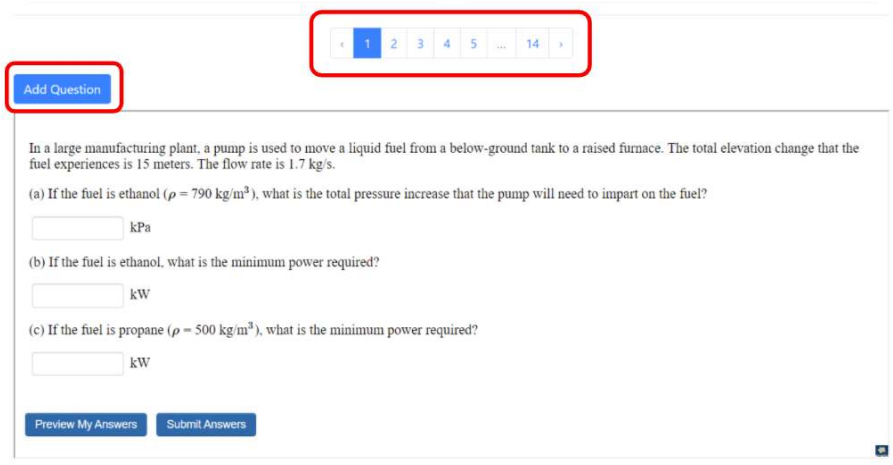


Figure 9.4.5: Use the numbers above the question to preview all assessments associated with the chosen tag

Adding Assessments by Page ID

The LibreTexts library editor and infrastructure is used as the primary mechanism to create, curate, and add problems to the ADAPT library. This is a straightforward procedure once a problem has been created on a LibreTexts library as a dedicated page. Each LibreTexts page has a ID# at the top (once logged in with an instructor account). This is the procedure to add an assessment on a new LibreTexts page into your assignment.

1. Open the Assignment.
2. Click "Add Assessments"
3. Open "Direct import by page ID" tab
4. Navigate to the page in LibreText library (Query or any other Library) and copy the page ID (numbers only)



Figure 9.4.6: Copy the page ID

5. Navigate back to Adapt page.
6. Choose Default Library (the library where the question is located) from drop-down menu and type/paste the page ID in the field on the right

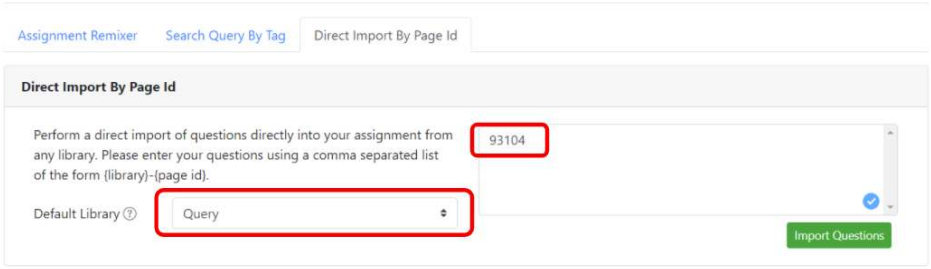


Figure 9.4.7: Choose Default Library and paste the page ID

7. Click "Import Questions". If the import was successful you will see a confirmation.

Note: you can add more than one question from the same library using page ID's. To do that, type/paste page ID's separated with comas and click "Import Questions".

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9.5: Assignment Control Panel

When viewing the assignments in ADAPT, there is a micro-control panel that allows instructors to dynamically control how students interact with the assignment (and its assessments).

Assignment Controls

To see the list of assignments available for grading:

1. Log into your Grader account
2. Select the course for grading
3. You will see all assignments currently available for grading

You can use the drop-down menu at the top to filter assignments by assignment group.

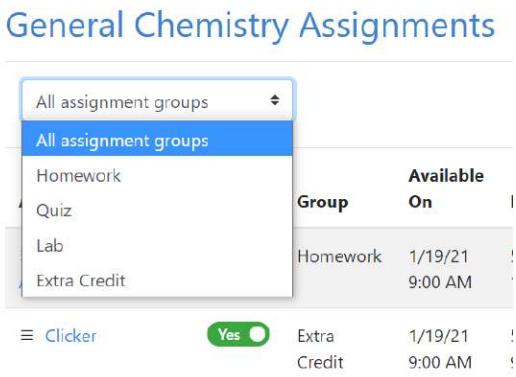


Figure 9.5.1: This drop-down menu allows you to filter all assignments by group

You can see that there are several toggle switches for each assignment that affect what information students can and cannot see at the time.

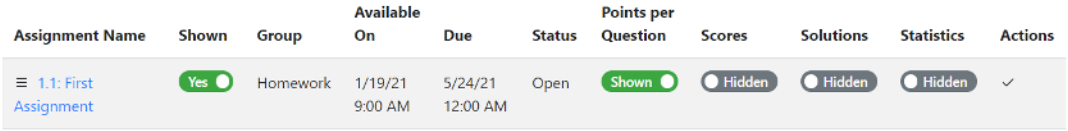


Figure 9.5.2: Assignment information and controls

- **Shown** - Controls whether the students can see the assignment. Only Instructor can use this toggle, Graders do not have access to change it.
- **Points per Question** - Determines if students can see how many points each question in the assignment is worth
- **Scores** - Releases the scores to the students when switched to "Shown"
- **Solutions** - If you have a solution uploaded you can let students see it by switching this toggle to "Shown"
- **Statistics** - When switched to shown, students can see a chart showing score distribution

You can also see the Available On and Due dates and Status of each assignment (automatically changes to "Closed" after the due date)

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9.6: Grading Open-Ended Assessments

The ADAPT system facilitates streamlined open-ended grading via a dedicated grading portal for each assignment.

How to grade open-ended Questions (aka Human grading)

1. To grade an assignment click the checkmark under Actions

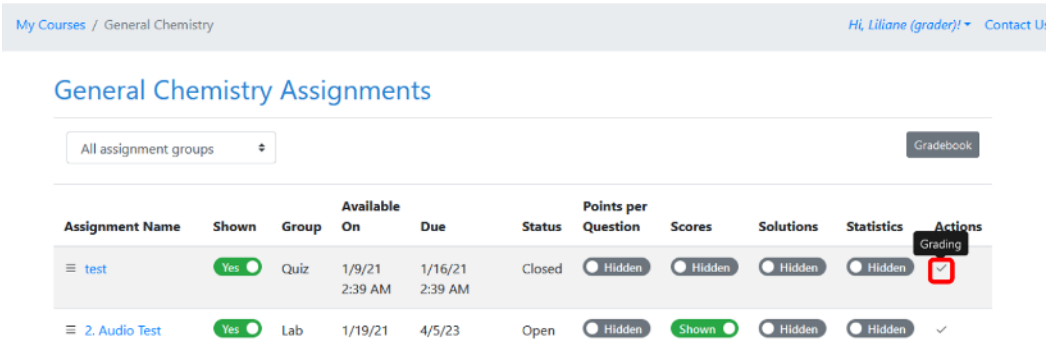


Figure 9.6.3: Click the checkmark to the right of assignment to grade to start grading

2. Figure 9.6.4 shows the first part of the grading interface

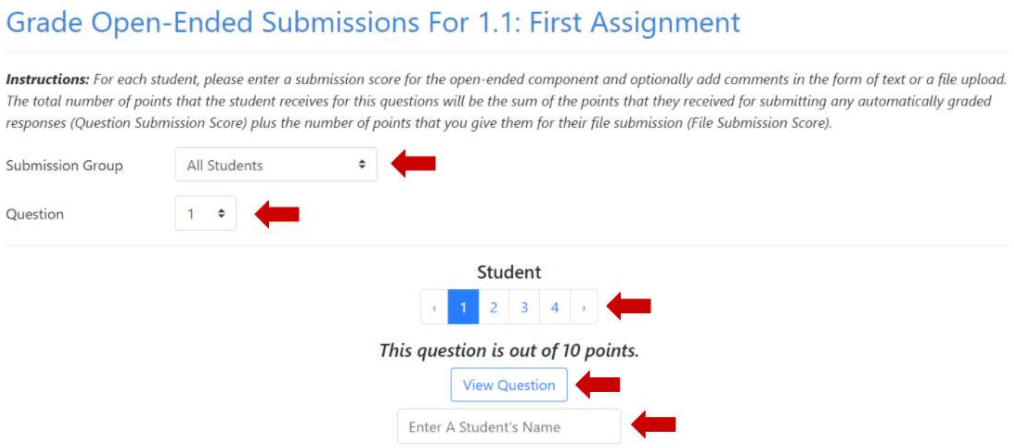


Figure 9.6.4: Grading controls

- **Submission Group** - lets you choose if you want to see submissions from all students, only graded submissions or only ungraded submissions
- **Question** - You can select what question you'd like to grade and see student's submissions for that question only
- **Student** - Switch from student to student using numbers
- **View Question** - question text opens in a new window for you to review
- **Enter Student's Name** - allows you to quickly find a specific student by first or last name

3. Figure 9.6.5 shows the second part of the grading interface

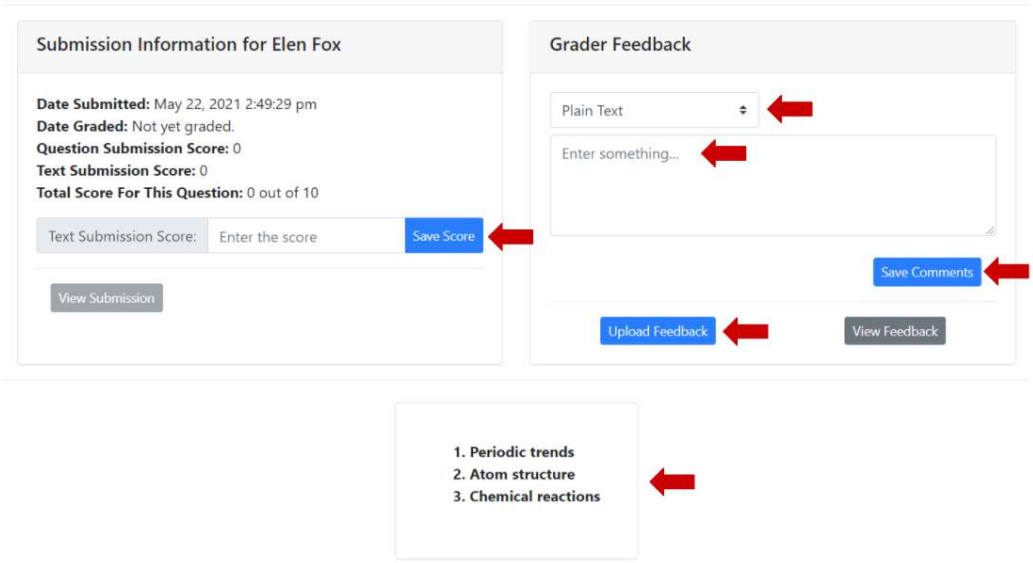


Figure 9.6.5: Grades and Feedback

- **Text Submission Score** - provide your score for this question. You have to click "Save Score" to save the score
- **Feedback Type** - choose Plain Text, Rich Text or Canned Response. See Graders Feedback to learn more
- **Comments section** - provide your feedback to the student. Students will see it when you release the scores. You have to click "Save Comments", otherwise your feedback won't be saved
- **Upload Feedback** - you can choose to upload your feedback as an image/pdf file or record an audio feedback. See Grader Feedback to learn more
- **Student's submission** - this can be text, a file or an audio submission (see Figure 9.6.6 below)

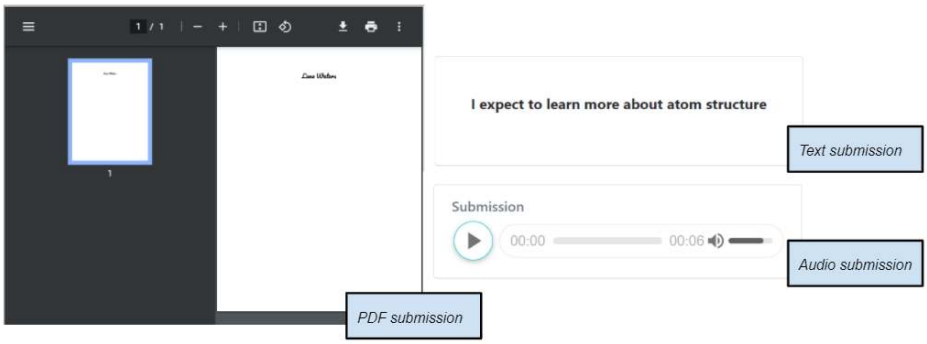


Figure 9.6.6: Different submission types

Grader Feedback

There are a few options to send Grader's feedback to students:

- **Plain Text** - as the name states this feedback is just text, without any special formatting options
- **Rich Text** - gives Graders some formatting options, like cut, copy, undo, redo, bold, italic, underline, subscript and superscript
- **Canned Response** - allows Graders to save their feedbacks and apply them when grading other students. Very useful in situations when you need to give the same feedback to several students. To use Canned Responses:
  1. Select "Canned Response" as Grader feedback type
  2. Click "Edit Responses"

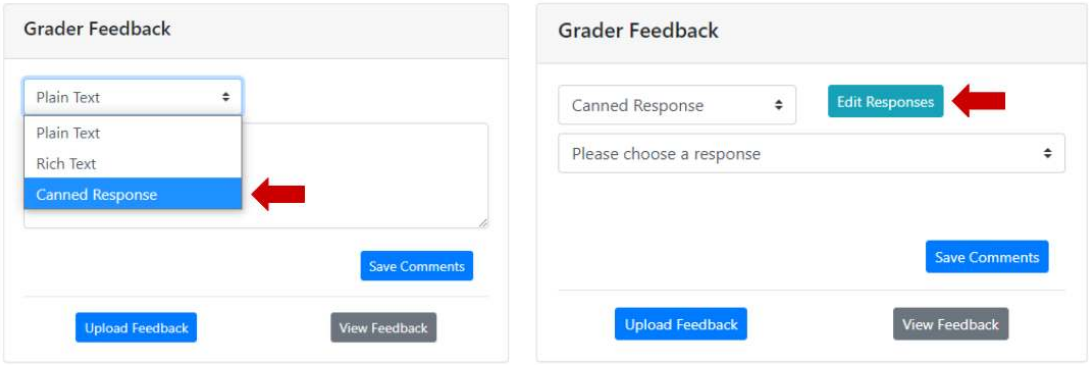


Figure 9.6.7: Select "Canned Response" and click "Edit Responses" to add a new canned response

3. Add your comment and click "Save Response"
4. You can add as many as you need. Click "Ok" when you're done

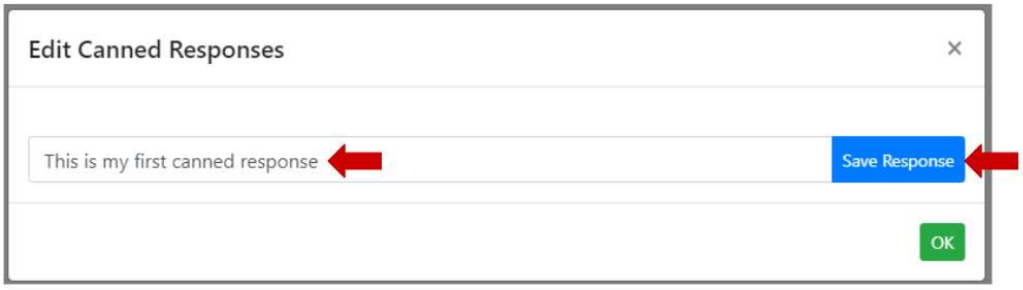


Figure 9.6.8: Type your Canned Response and click "Save Response". Repeat to add more Canned Responses.

5. To delete caned responses use Recycle Bin icon next to it



Figure 9.6.9: Click the Recycle Bin icon next to the Canned Response to delete it

6. To use one of your Canned Responses, select it from the drop-down menu and click "Save comments"

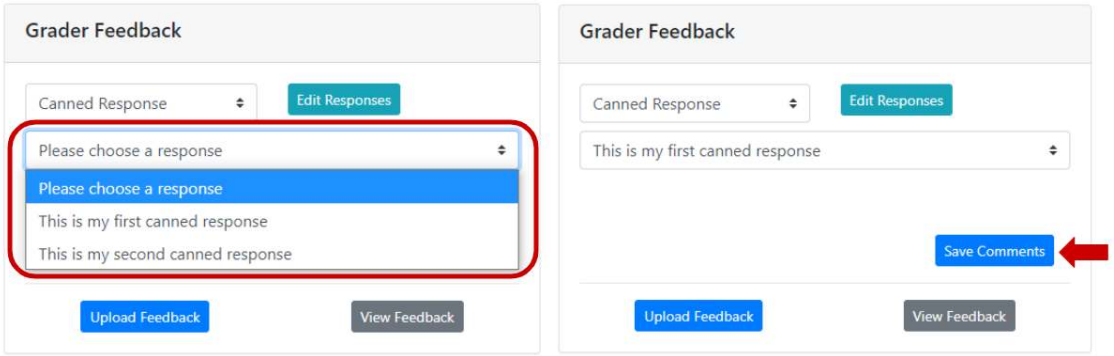


Figure 9.6.10: To add one of the Canned Responses as your feedback select the response and click "Save Comments"

- **PDF/Image Feedback** - Graders can upload a file as their feedback. To do that:
  1. Click "Upload Feedback"

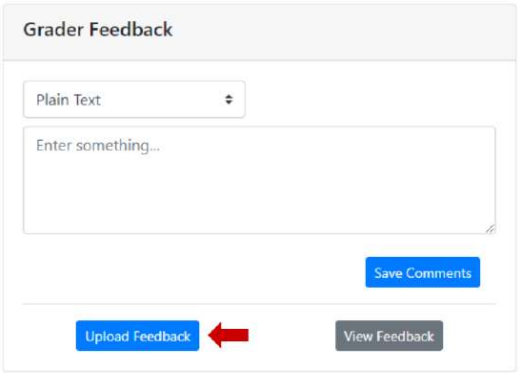


Figure 9.6.11: Click "Upload Feedback" to add a PDF or Image to your Feedback

  2. Click "Browse" and choose a file from your device or simply drag and drop the file. Click "Submit"



Figure 9.6.12: Click "Browse" to select the file or just drag and drop it in this area

  3. To preview your file upload, click "View Feedback". Your file will be displayed below

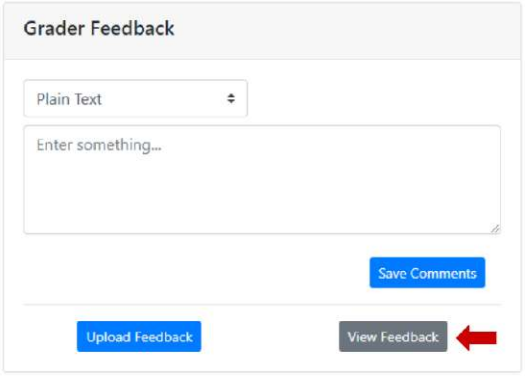


Figure 9.6.13: To see the file you've uploaded, click "View Feedback"

  4. To return to student's submission click "View Submission" under Submission Information

- **Audio Feedback** - you can record an audio feedback up to 1 minute long. To do that:
  1. Click "Upload Feedback"

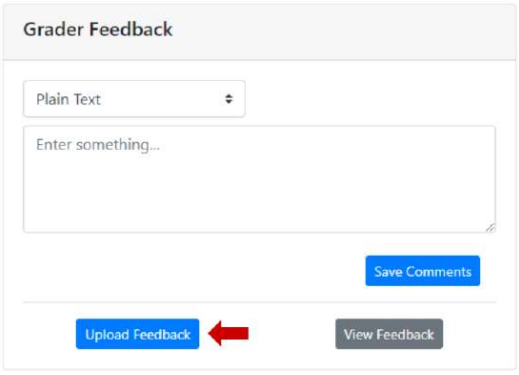


Figure 9.6.14: Click "Upload Feedback" to add an audio feedback

2. Switch the toggle from "PDF/Image" to "Audio" by clicking on it
3. Click the Microphone icon to start recording. Click the Stop icon when you're done. Use Pause icon (will be available once you start recording) to pause your recording. Optional: You might see a message from your browser asking if you want to allow this website access to your microphone. You must select "Allow" to use the audio feedback feature.



Figure 9.6.15: Make sure the toggle is switched to "Audio"

4. You can create several recordings. Click on the name of the recording to access controls.
   To listen to the recording click Play button below
   To delete the recording click the "X" to the left from the name
   To save the recording to your device use the save icon with an arrow
   To save it as your feedback use the floppy disk icon



Figure 9.6.16: Click the floppy disk icon to save your feedback

5. You will see your audio feedback added below. To return to student's submission click "View Submission" under Submission Information

Communicating with Students

Students can send questions about their grades or submissions to the Grader. Grader will receive an email similar to the one shown in Figure 9.6.17. Grader can reply to the email directly or use the provided link that will take them to the grading section. The question that the message was about will be brought up. From here the process is the same as during the first time grading. Score can be updated or left the same, new feedback can also be added if needed

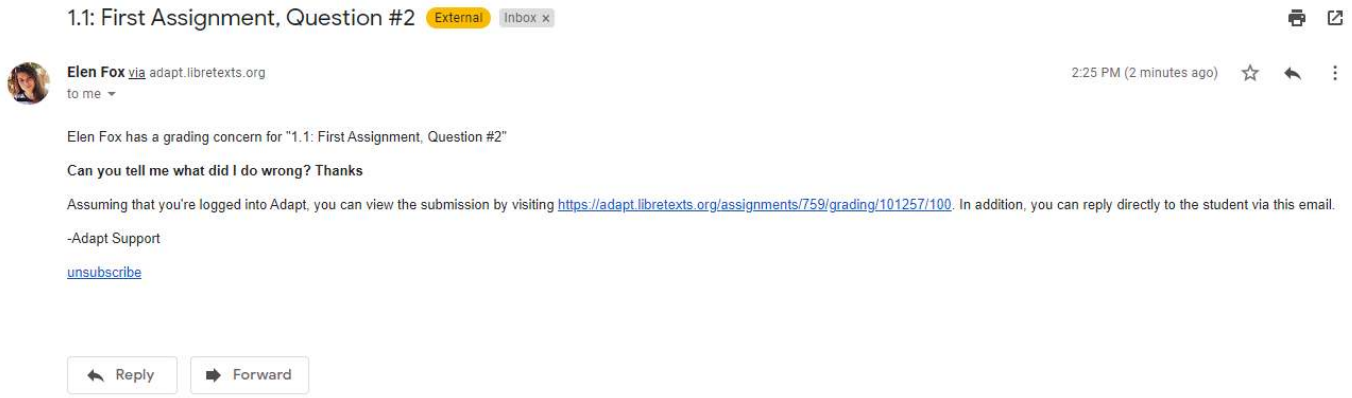


Figure 9.6.17: Email received by Graders when students contact them with questions

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9.7: Embedding Summative ADAPT Assessments into Textbook

Section 5.7 of the Construction guide discusses how to embed interactive assessment into Libretexts pages in a formative manner (i.e., without a gradebook). The ADAPT system also allows the embedding of Adapt assessments in your LibreTexts book in a summative manner. This allows students to find them easier and complete the assignments without leaving the textbook.

You can create a separate page for embedding assignments or add them to existing pages. See Construction Guide to learn more on page creation.

Note

Students have to be logged into their Adapt account to see the embedded assignment. Assignments won't be visible in the print version of your book.

Embedding Summative Assessments

To embed a new Adapt assignment to your LibreTexts page:

1. First add the assignment and assessments to ADAPT itself. See Adding/Importing Assignments and Adding New Assessments to learn more
2. Copy the assignment ID. You can select the text → Right click → Copy or just click on the copy icon next to the ID

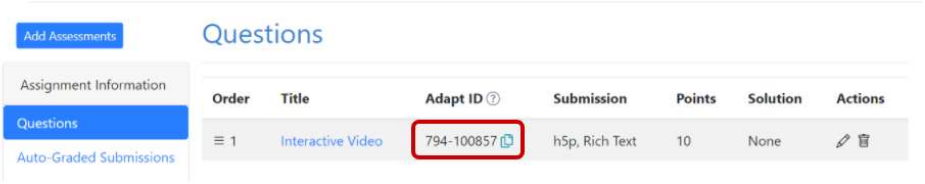


Figure 9.7.1: Copy the Adapt ID

3. Open the LibreText page that you'd like to add this assessment to
4. Click Edit (See more on page editing in the Basic Editing section of the Construction Guide)
5. Select Adapt Icon to insert a new Adapt assessment



Figure 9.7.2: To embed Adapt assessment click on the Adapt icon

6. Type/paste your Adapt ID that you copied in Step 2 and click "OK"



Figure 9.7.3: Type or paste the Adapt ID and click OK

7. You can edit the numbering if you have more than one embedded assessment. If you have 3 Adapt assessments on the same page by default they all will be labeled “ADAPT 1”, but if you change the numbering you can have “ADAPT 1”, “ADAPT 2” and “ADAPT 3”

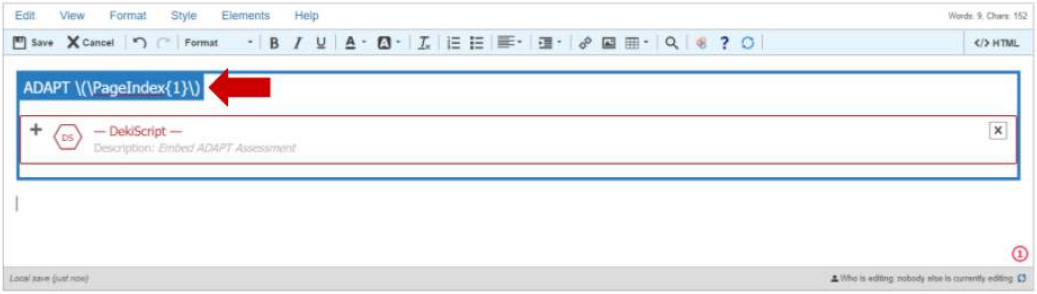


Figure 9.7.4: You can change the numbering by editing the number in parentheses

8. Click “Save” to save your page. You should see your Adapt assessment embedded.

Note

If you see an error message “You are not logged in!” you need to log in using Campus Login or (if you don’t have campus login setup) you need to open Adapt website, log into your account and then refresh the LibreText page.

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9.8: Interfacing ADAPT to LMS via LTI

In terms of the URL, they all look the same except for the final parameter. For example, if you go to:

https://adapt.libretexts.org/lti/canvas/config/my-super-cool-college

you'll find "my-super-cool-college" within their config information. The reason for this, is ADAPT consumes the final parameter to know which school it is and sends them back to the correct Canvas authorization endpoint.

Also, once they go to the URL and fill out the form, I get an email with how they set it up and then I connect with them for the final steps (basic testing of the connection). So, feel free to pass out the URL with the last parameter to be changed to their college (or some abbreviation):

https://adapt.libretexts.org/lti/canvas/config/wwu

or

https://adapt.libretexts.org/lti/canvas/config/western-washington-university

would be some good examples.

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CHAPTER OVERVIEW

10: Commons and Conductor

10.1: Commons

10.1.1: Top Line

10.1.2: Blue Bar

10.1.3: LibreTexts Map

10.1.4: Catalog

10.2: Conductor

10.2.1: Conductor Home

10.2.2: Project

10.2.3: Ancilliary Materials and Team Members

10.2.4: Communications and Timeline

10.2.5: Peer Review

10.2.6: Accessibility Review

10.3: Conductor for Admins

10.3.1: Control Panel

10.3.2: Project Page for Administrators

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SECTION OVERVIEW

10.1: Commons

The Commons is the new front page to the LibreTexts system.



At the top of the Commons front page are a set of links.

- About LibreTexts
- Instructor Account Request
- Campus Commons
- Login to Conductor

which are described on the next page, section 10.1.1

The Blue Bar has another set of links

- Catalog
- Libraries
- Collections
- Homework
- Under Development

which are described in section 10.1.2

The last two sections in this chapter are a map of the LibreTexts Libraries (10.1.3) and a guide to using the commons to find a LibreTexts and information about it. (10.1.4)

10.1.1: Top Line

10.1.2: Blue Bar

10.1.3: LibreTexts Map

10.1.4: Catalog

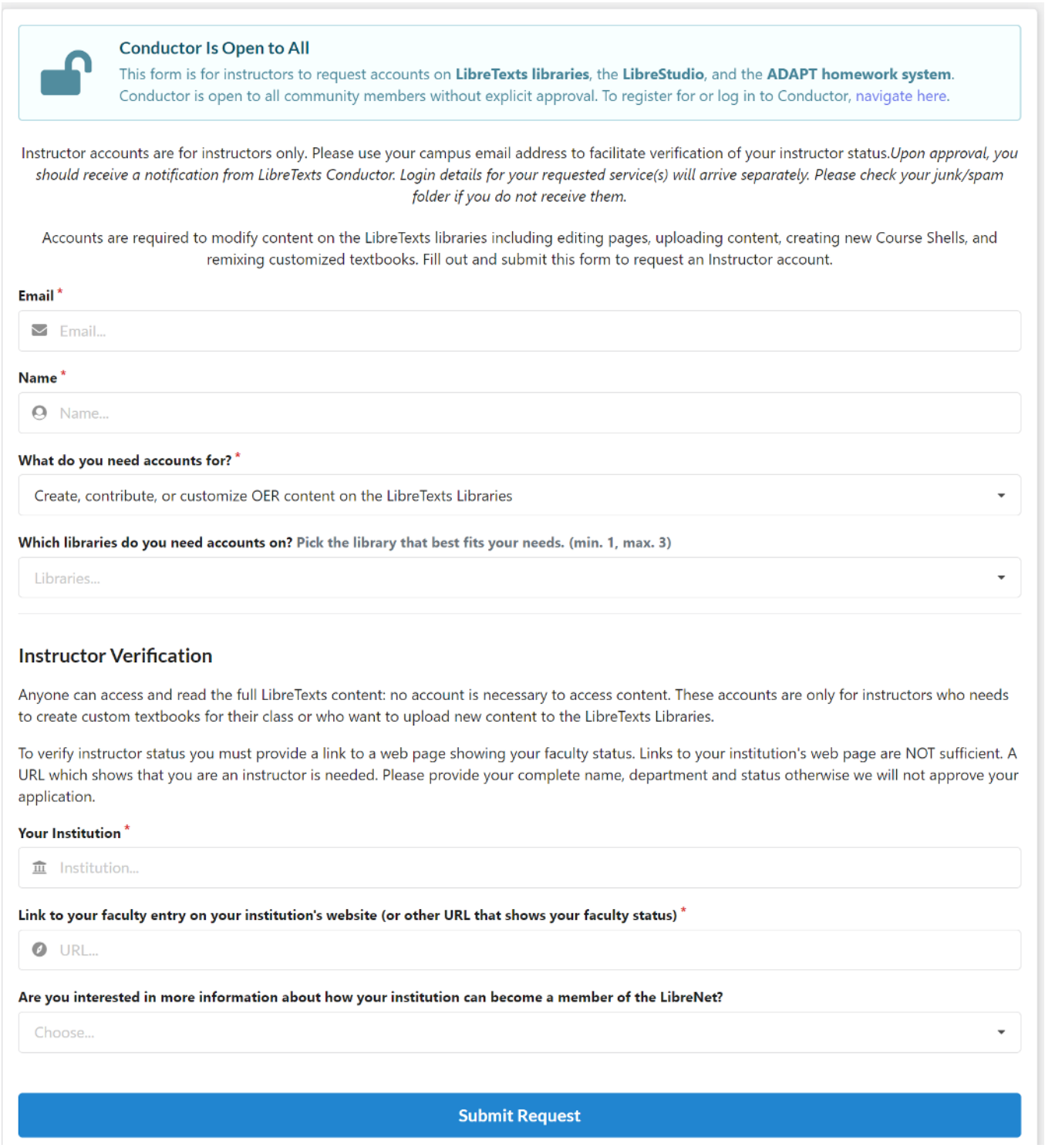
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10.1.1: Top Line

At the top of the Commons front page are a set of links. The first About LibreTexts takes you to the project front page where there is information about the team, our mission and values, the LibreTexts Terms of Service Agreement, Privacy Policy and DMCA Copyright Policy.

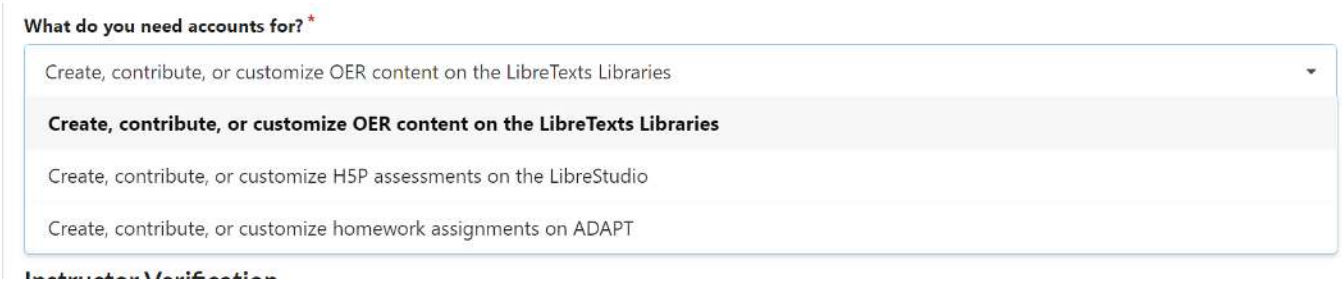
Registering for an Instructor Account

The second choice, moving from left to right, is for registering for instructor accounts. Only instructors (broadly construed) in higher and secondary education who wish to build their own custom LibreTexts need accounts. Everybody else is free to read and use LibreTexts without an account. Selecting this choice brings you to the application page



Most of these are self explanatory HOWEVER we strongly suggest you use your institutional email address and not an alias. LibreTexts prefers to provide access using Single Sign On which requires verification through the Microsoft Active Directory or Google Workspace (essentially that your email be either Outlook or Gmail). A UserID Password combination can be provided, but this requires LibreTexts to maintain and protect your password.

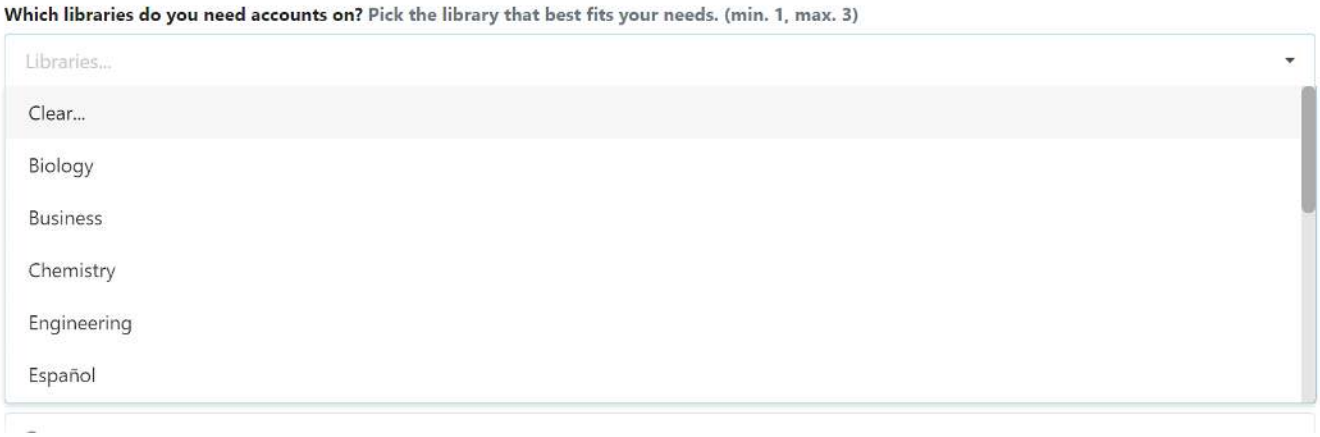
On the third line **What do you need accounts for?** there are three choices



you can choose whether you want an account for constructing OER in a LibreTexts library, for using or building H5P questions in LibreTexts STUDIO or for using the LibreTexts ADAPT homework system. The H5P and ADAPT systems are for use in LibreTexts or in conjunction with LibreTexts materials. Only faculty from LibreTexts Network members can use ADAPT or the STUDIO in other systems.

If you choose LibreSTUDIO or ADAPT after our checking your faculty credentials you will receive a registration code

If you select Create, contribute, or customize OER content on the LibreTexts Libraries, a new line appears



LibreTexts accounts are tied to libraries. You MUST select one. It should be the library where you will be doing most of your text building. Some people teach in more than one area, so they might want multiple accounts. LibreTexts will only provide a maximum of three accounts in different libraries. HOWEVER, administrators can it move books from any library into any other library and the remixer allows instructors to build books incorporating pages from all the different libraries.

In order to verify your status as an instructor, we ask for a **Link to your faculty entry on your institution's website (or other URL that shows your faculty status)**

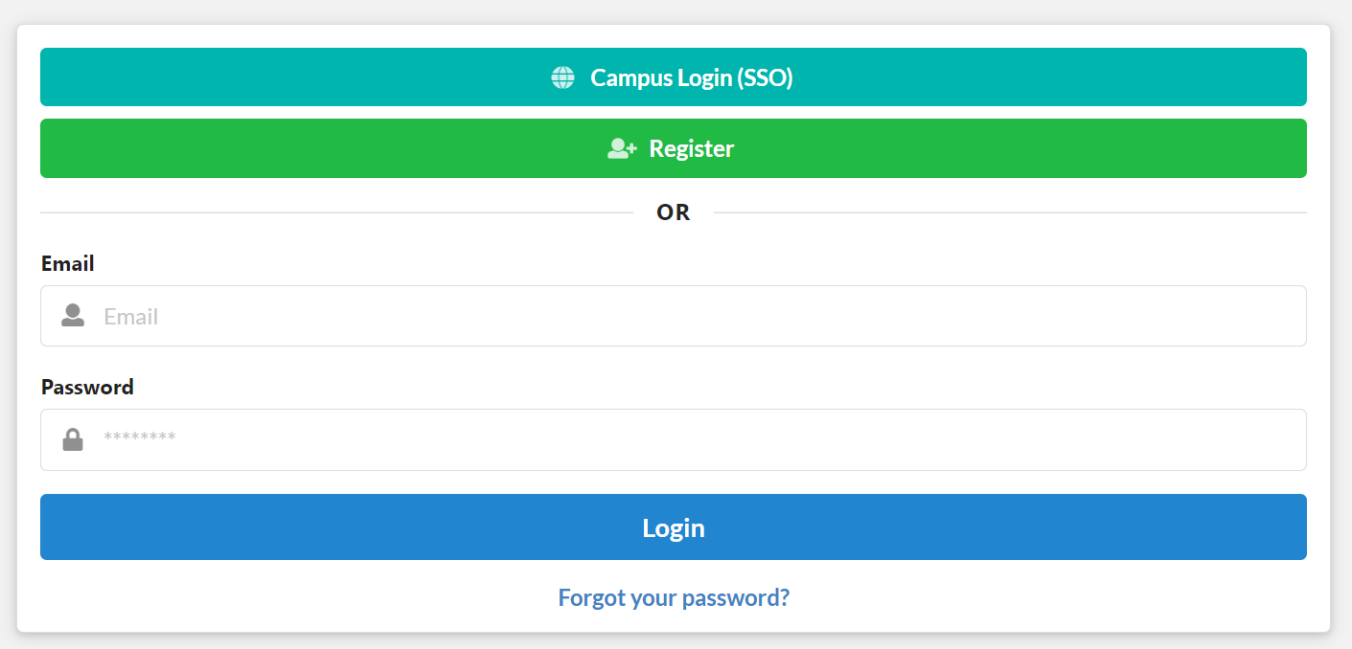
DO NOT provide an email address, a page that requires a password (we don't have it), a linkedin or social media page or a link to the institutional main page. Ideally a link to your personal institutional page is best, but many other things are fine such as a page with your name in a schedule of classes, a campus news release, etc. If none of these are available, an email from your departmental chair, an image of your ID, etc. can be sent to info@libretexts.org.

Campus Commons

Moving along the top we come to a drop down menu which accesses the Campus Commons for LibreNET members showing the LibreTexts for each. These commons are controlled by the LibreNET members, with more details to be found in the next chapter about the Conductor

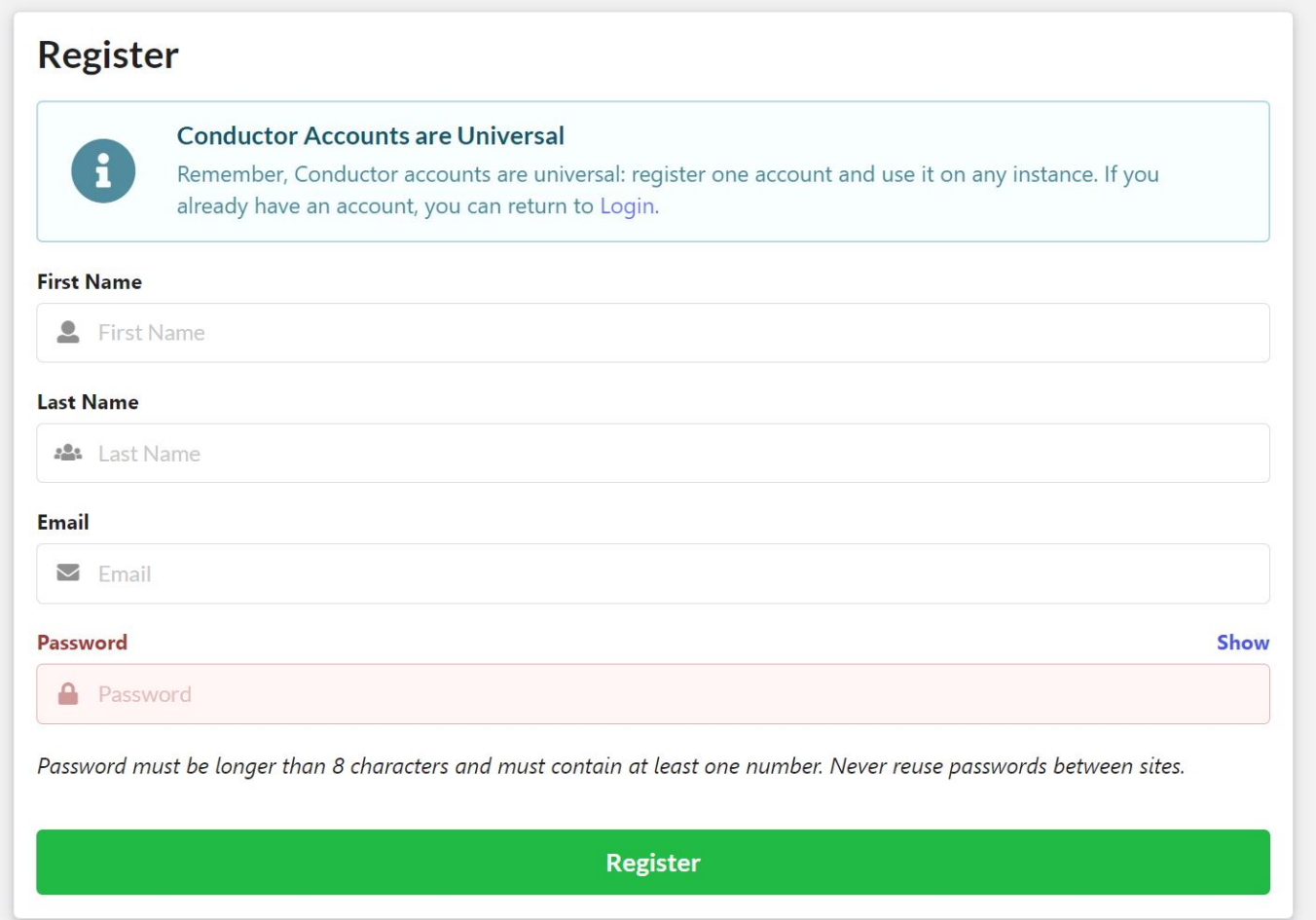
Conductor Log In

At the end of the row is a button for logging into the Conductor. The Conductor is LibreTexts project management app and provides numerous services both to individual authors and to LibreNET institutions. It will be described in detail in the next chapter. Selecting this option brings up the login page



If you have not registered with the Conductor but want to use your Outlook/Gmail account go directly to Campus Login (SSO). If you want to use a Email/password type of login go to Register. After you have registered you should continue using the method of logging in to Conductor that you have selected.

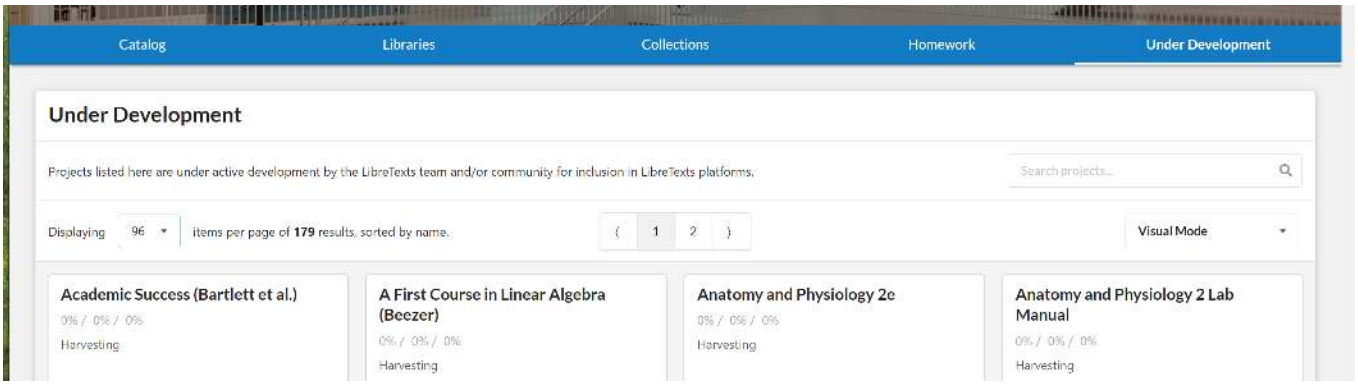
If you choose to use the Email/password combination you should fill out the registration form that appears when you select Register.



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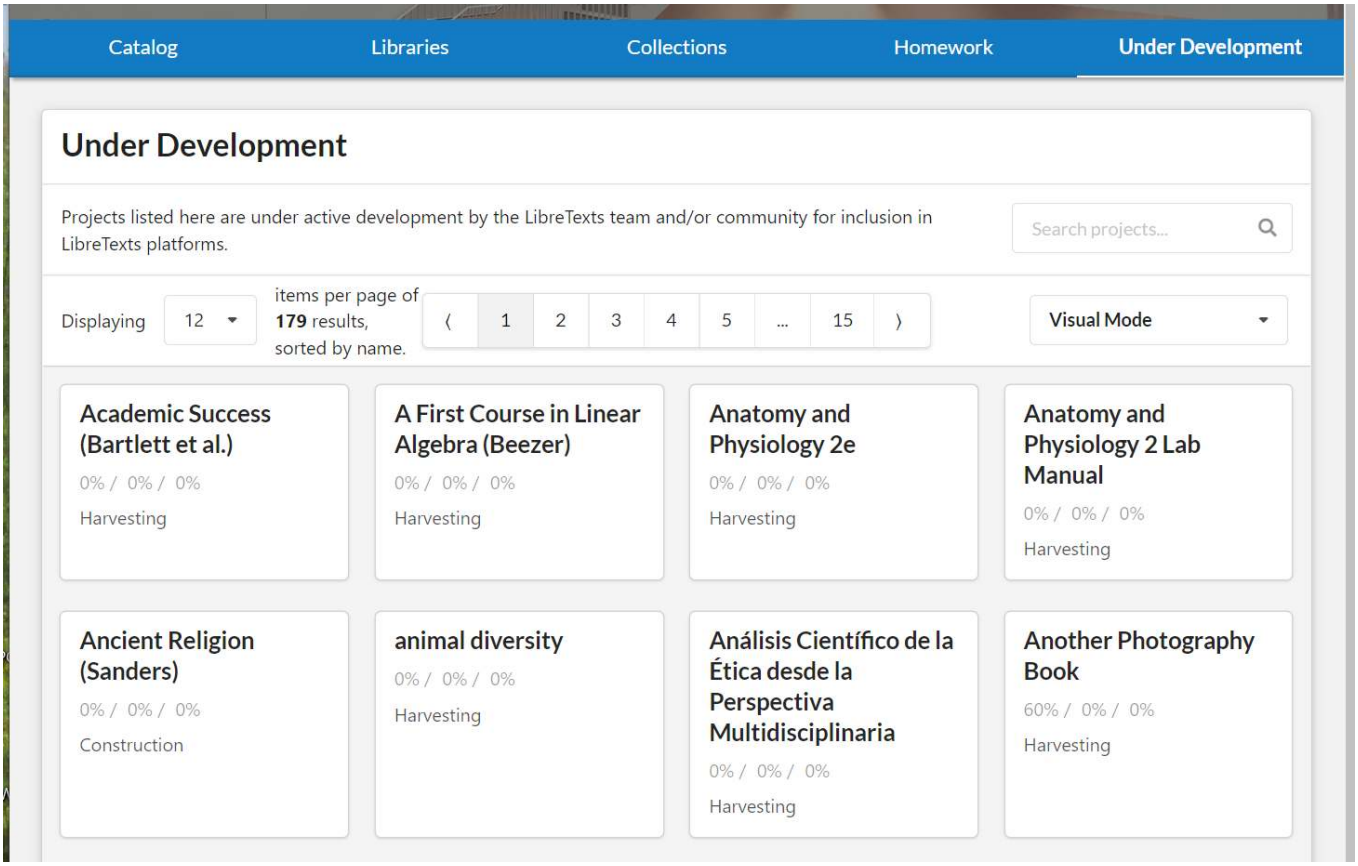
10.1.2: Blue Bar

Below the image there is a Blue Bar with the entries Catalog, Libraries, Collections, Homework and Under Development



Under Development

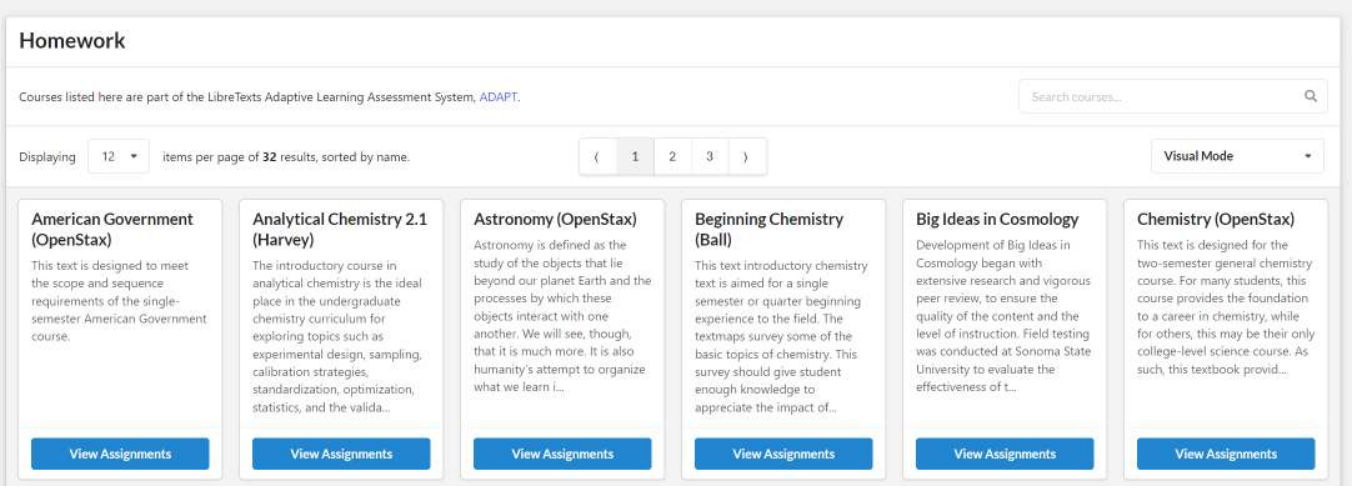
Under development lists all projects for LibreTexts which are, of course, under development. If you know of an open resource that LibreTexts should include you can submit a request at https://harvest.libretexts.org. Doing so will start a project for integration of the resource into LibreTexts. This will be discussed in the next section about the LibreTexts Conductor Project Management. Selecting the Under Development Button brings up a listing.



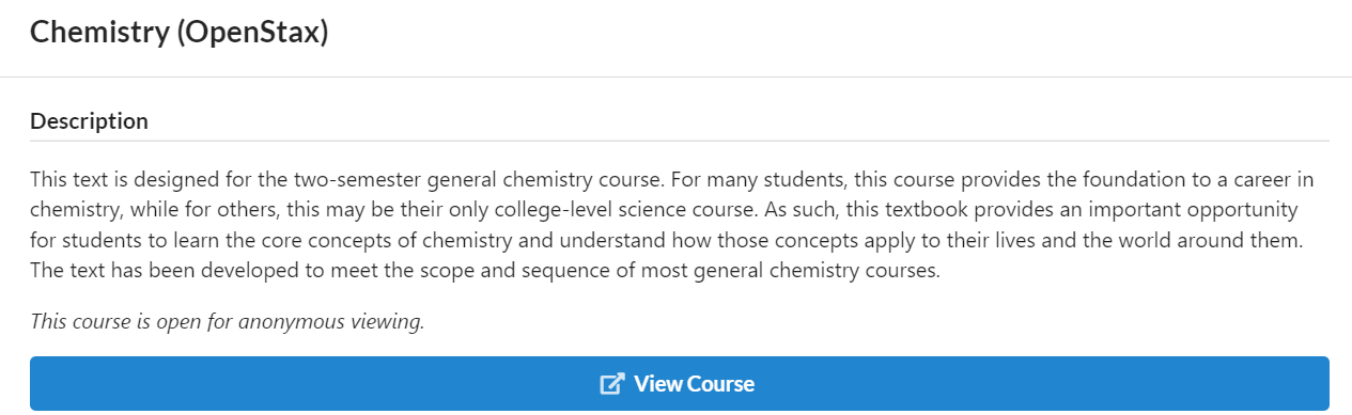
The three numbers are first, the percentage of the import that has been completed, peer review, and accessibility review. One of the advantages of your institution being a member of the LibreTexts network is that your submissions would be dealt with on a priority basis.

Homework

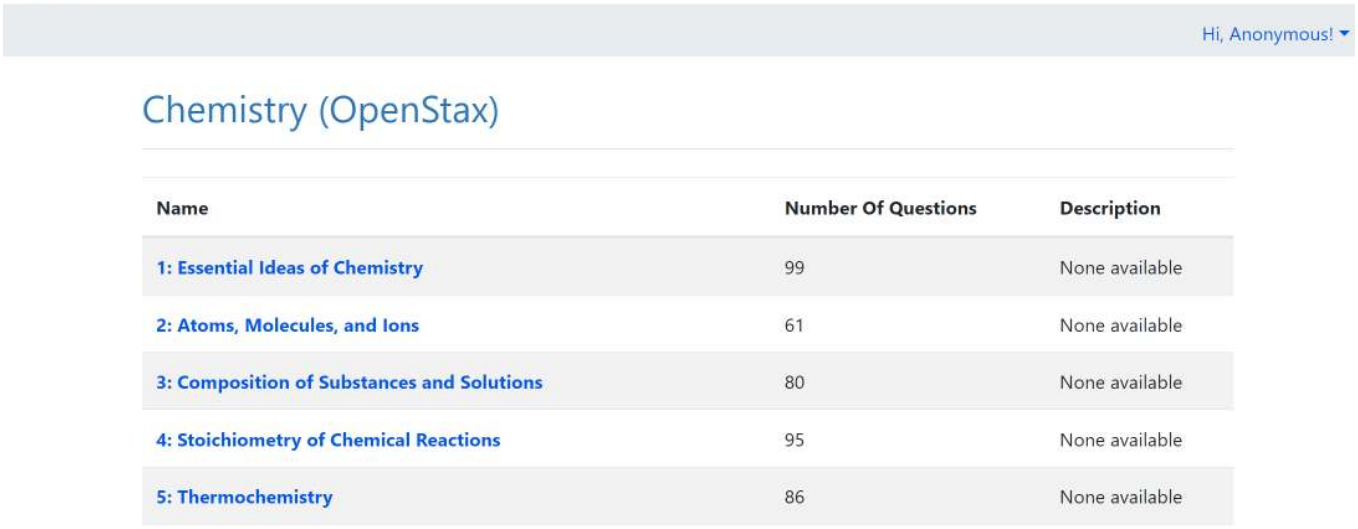
Moving from right to left, the next button lists books for which homework is available.



If you click on View Assignments you will see



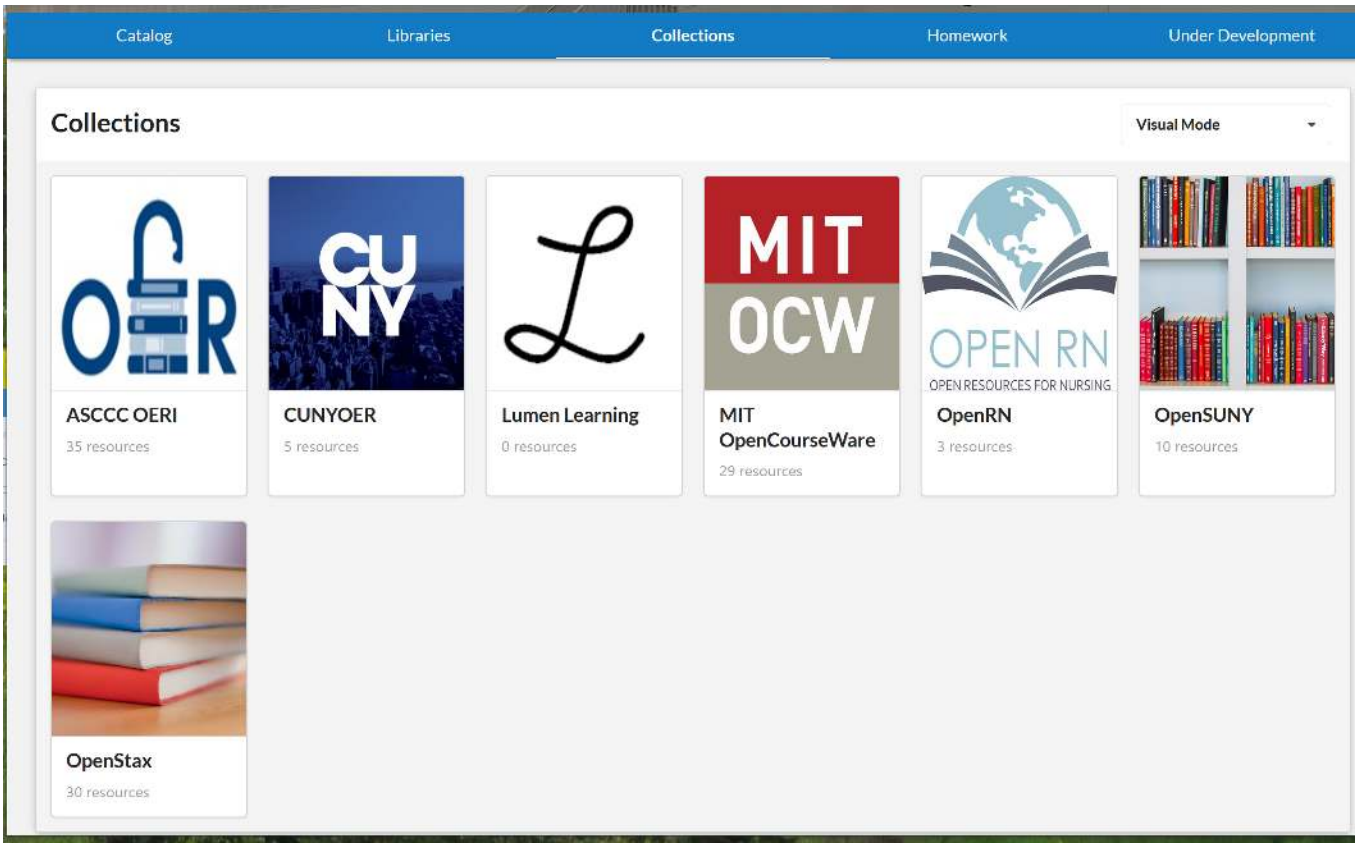
and if you click on View Courses



You can see the number of questions available in the ADAPT homework system, but without registering for an instructor's account in ADAPT you will not be able to see the questions.

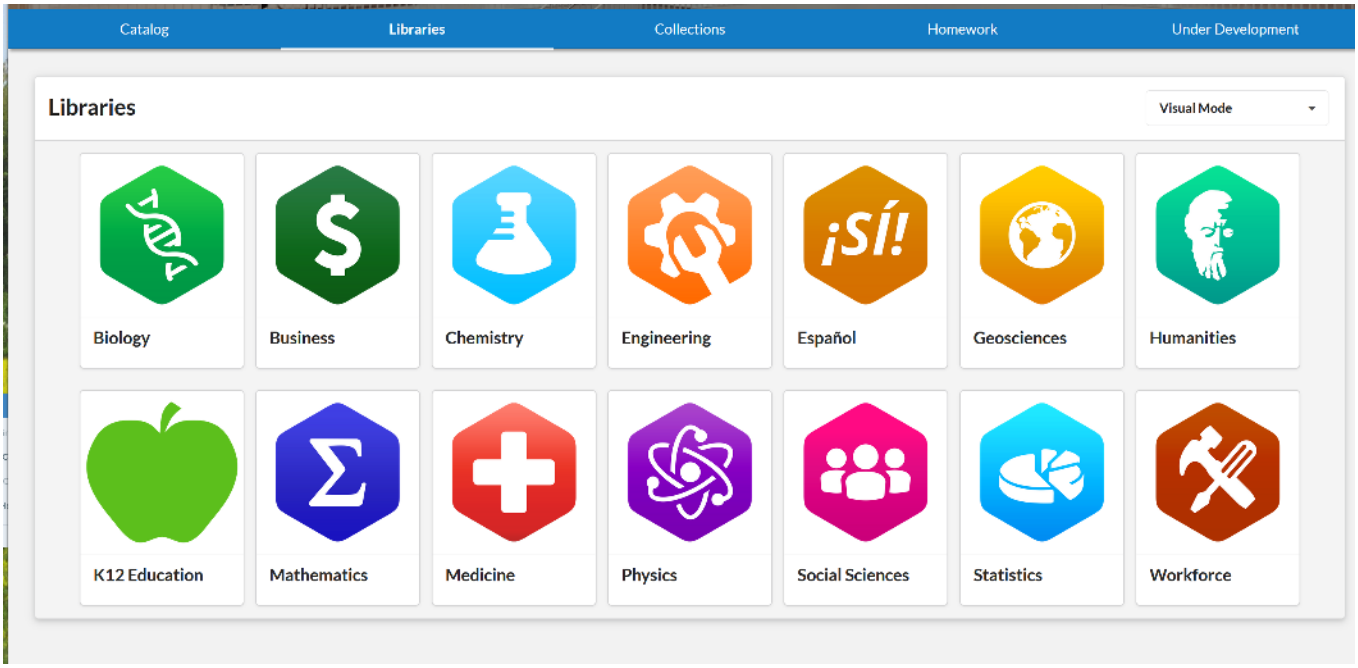
Collections

Collections are LibreTexts books from a single source.

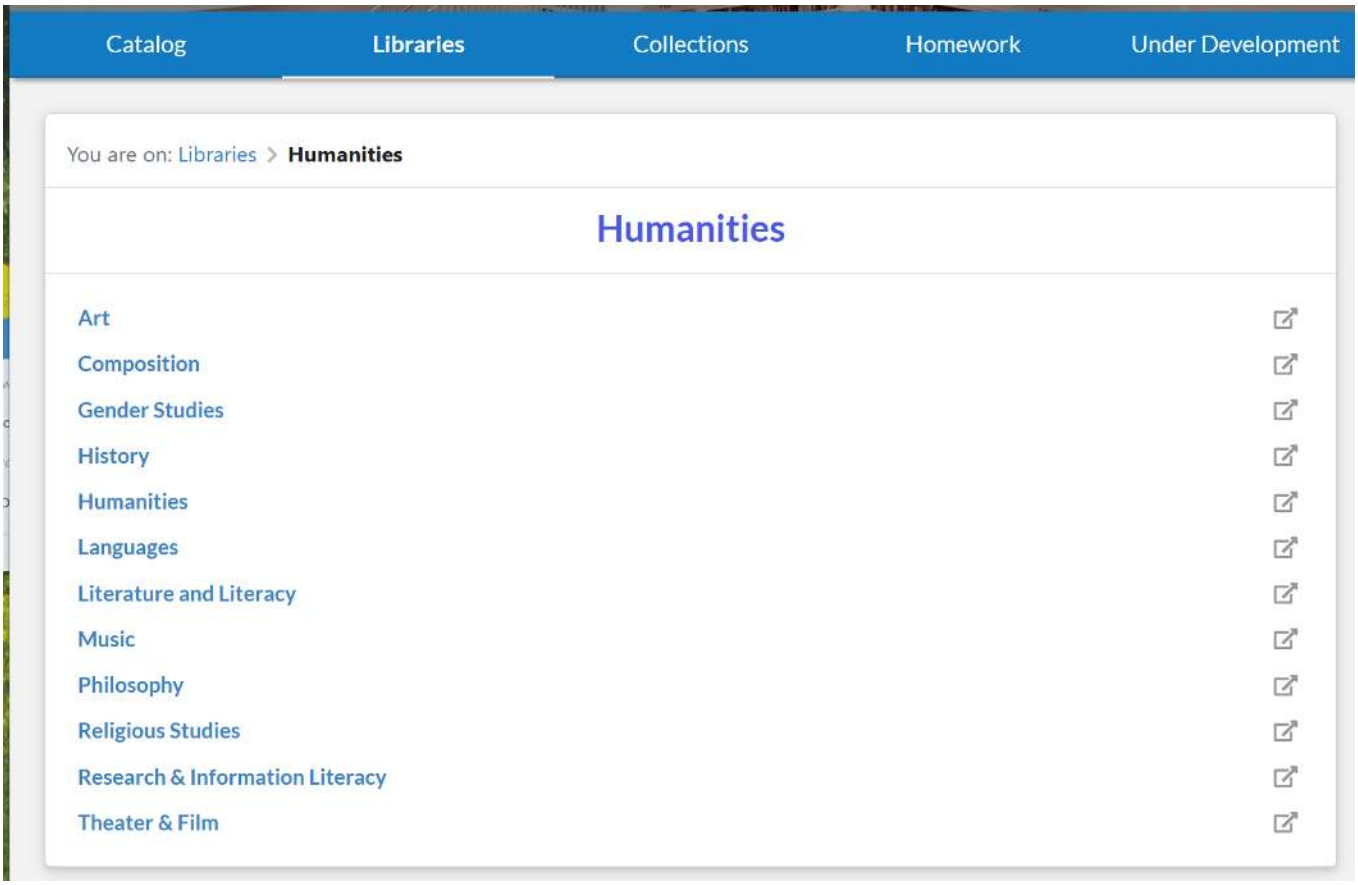


Libraries

LibreTexts has 14 libraries

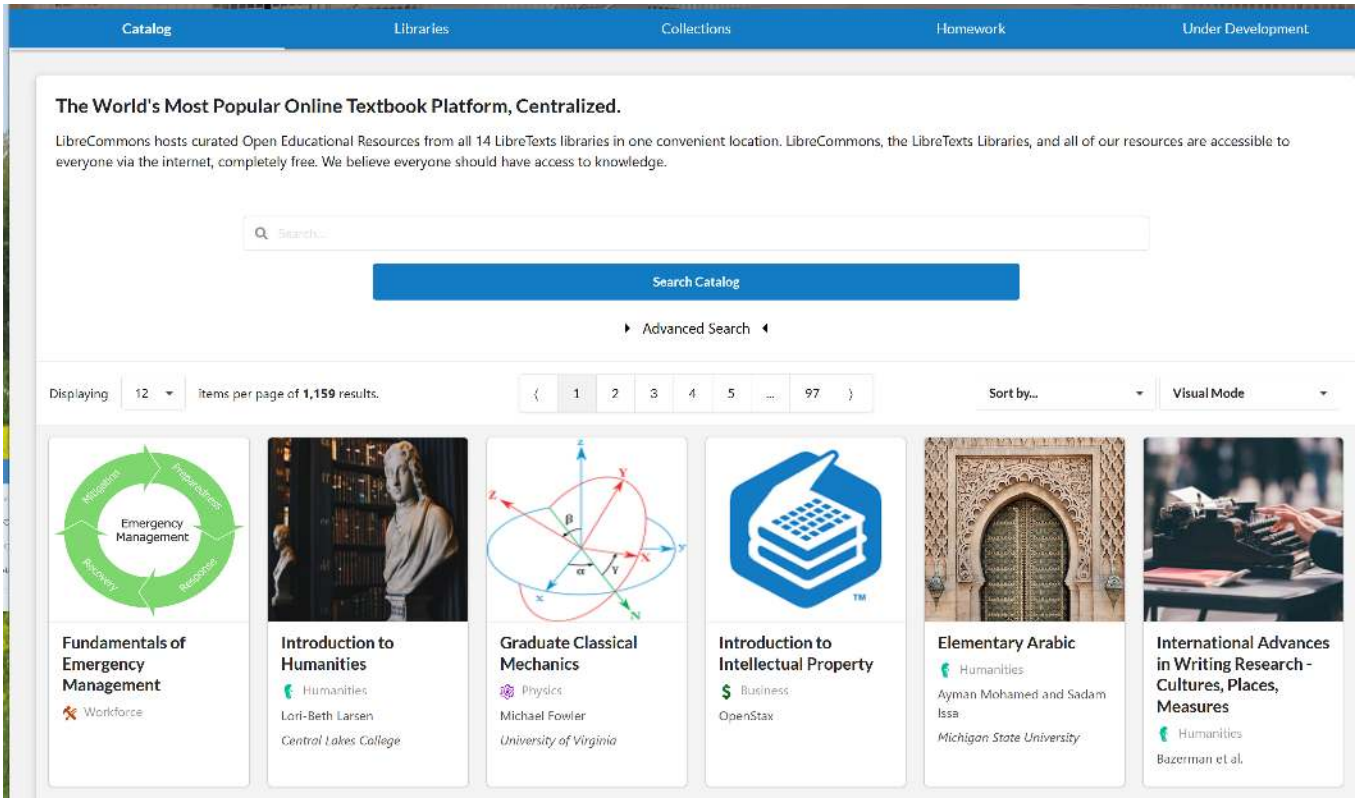


and each library has a number of sections



A detailed map can be found on the next page. You can go to the library directly or to any of the sections by clicking on the links

Catalog



Details about using the catalog can be found in section 10.4.

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10.1.3: LibreTexts Map

In addition to the Libraries and Sub-Libraries shown below, there are other OER resouces in the Learning Materials section of each library and in the Course Shells.

Library	Sub-Libraries
Biology 	• Biotechnology • Biochemistry • Botany • Cell and Molecular • Computational Biology • Ecology • Evolutionary & Developmental • Genetics • Human Biology • Introductory and General • Microbiology
Business 	• Accounting • Business • Finance • Law • Management • Marketing
Chemistry  https://commons.libretexts.org/libraries/chem	• Analytical • Biological • Introductory, Conceptual, and GOB • Environmental • General • Inorganic • Organic • Physical and Theoretical
Engineering 	• Aerospace • Biological • Chemical • Civil • Computer Science • Electrical • Environmental (Sustainability and Conservation) • Industrial & Systems • Introductory • Materials Science • Mechanical

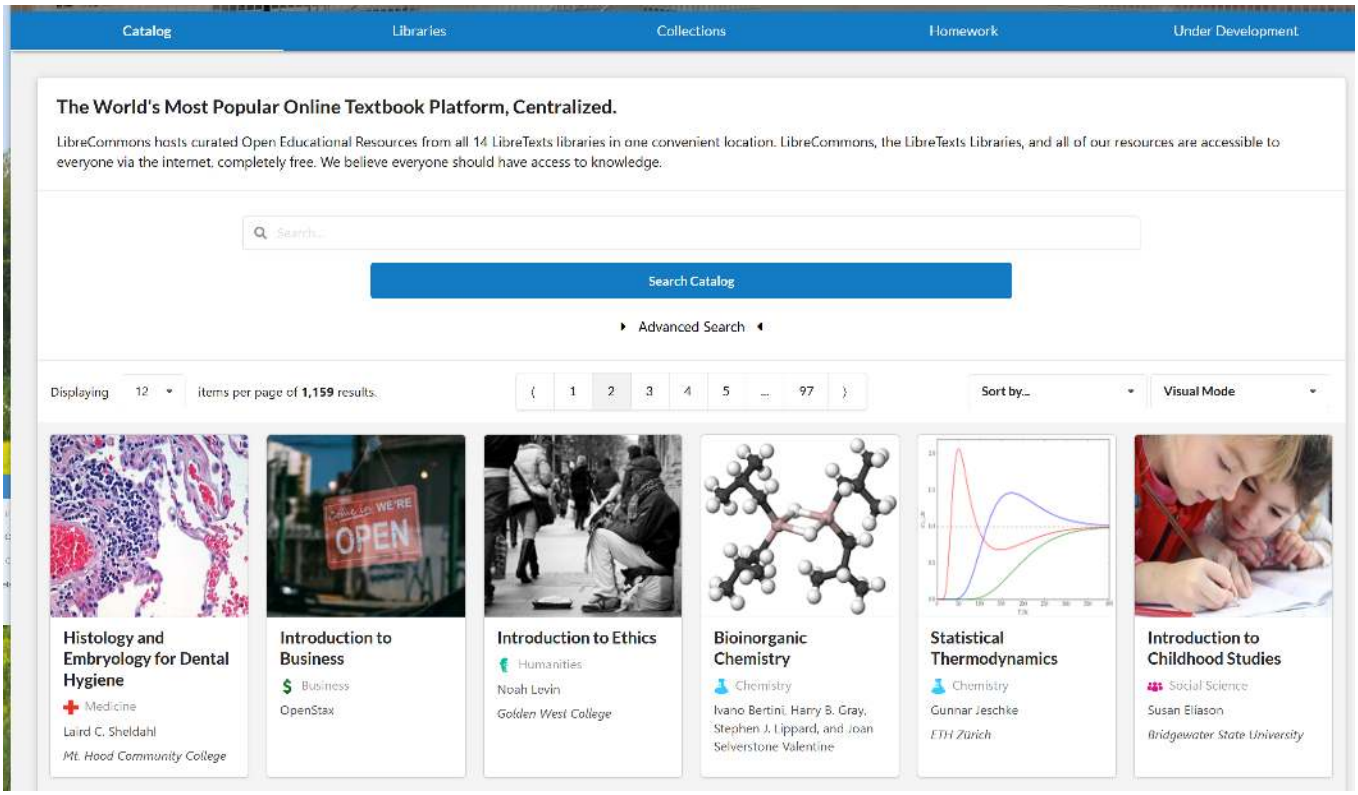
Library	Sub-Libraries
Espanol 	• Ciencias Sociales • Estadística • Geociencias • Ingenieria • Matemáticas • Medicina • Negocio • Química • Vocacional
GeoSciences 	• Geography • Geology • Meteorology & Climate Science • Oceanography • Sedimentology • Seismology • Soil Science
Humanities 	• Art • Composition • Gender Studies • History • Humanities • Languages • Literature and Literacy • Music • Philosophy • Religious Studies • Research & Information Literacy • Theater & Film
K-12 	• Composition • Economics • Geography • Health • Human Biology • Journalism • Mathematics • Philosophy • Photography • Science and Technology • Sociology • Spelling • United States Government

Library	Sub-Libraries
Mathematics 	• Abstract & Geometric Algebra • Algebra • Analysis • Applied Mathematics • Arithmetic & Basic Math • Calculus • Combinatorics & Discrete Mathematics • Differential Equations • Geometry • Linear Algebra • Mathematical Logic & Proofs • Scientific Computing, Simulations, and Modeling • Pre-Algebra • Precalculus & Trigonometry
Medicine (Health) 	• Allied Health • Anatomy & Physiology • Health & Fitness • Medicine • Nursing • Nutrition • Pharmacology & Neuroscience • Veterinary Medicine
Physics 	• Astronomy & Cosmoloogy • Classical Mechanics • College • Conceptual • Electricity & Magnetism • Mathematical Physics & Pedagogy • Modern Physics • Nuclear & Particle Physics • Optics • Quantum Mechanics • Relativity • Thermodynamics & Statistical Mechanics • University • Waves & Acoustics

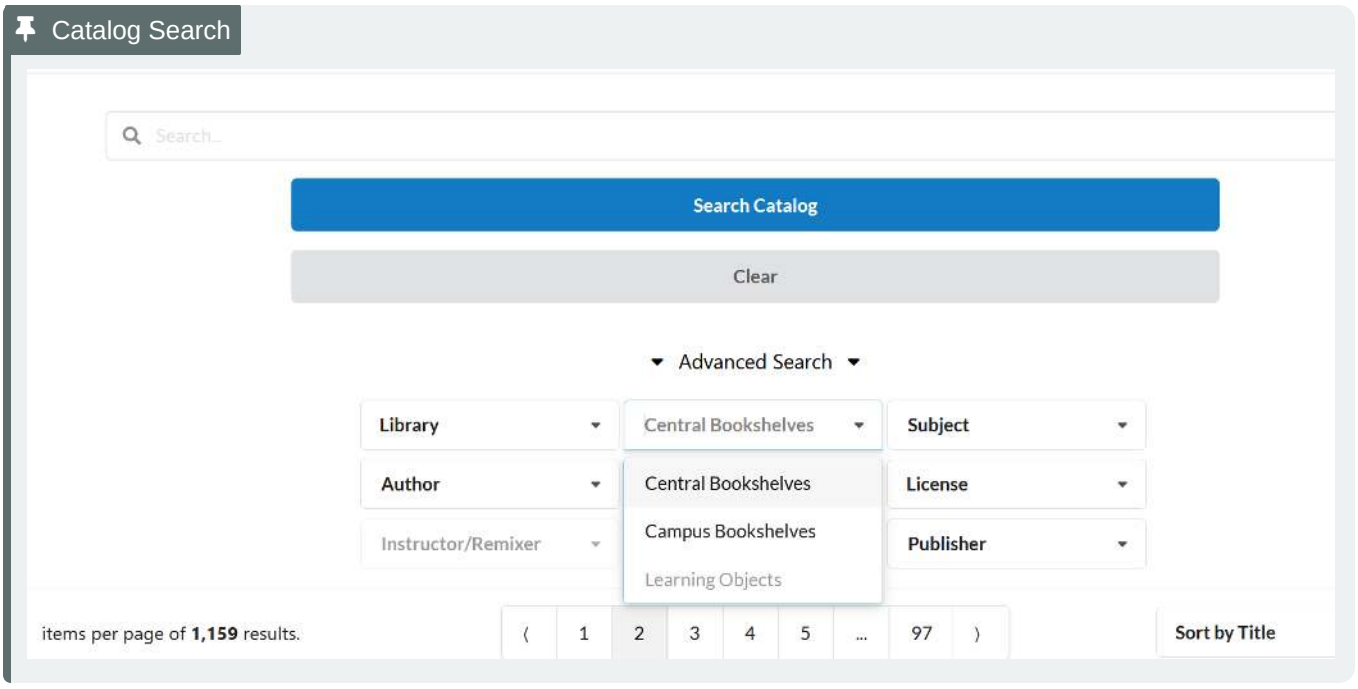
Library	Sub-Libraries
Social Sciences 	• Anthropology • Communication Studies • Counseling & Guidance • Early Childhood Education • Economics • Education & Professional Development • Human Development • Human Geography • Political Science & Civics • Psychology • Social Work & Human Services • Sociology
Statistics 	• Applied Statistics • Computing & Modeling • Introductory Statistics • Probability Theory • Time Series Analysis
Workforce 	• Allied Health • Arts, Audio Visual Technology, and Communications • Computer Applications & Information Technology • Construction • Corrections • Electronics Technology • HVAC & Power Plant Operations • Hospitality • Manufacturing • Water Systems

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10.1.4: Catalog



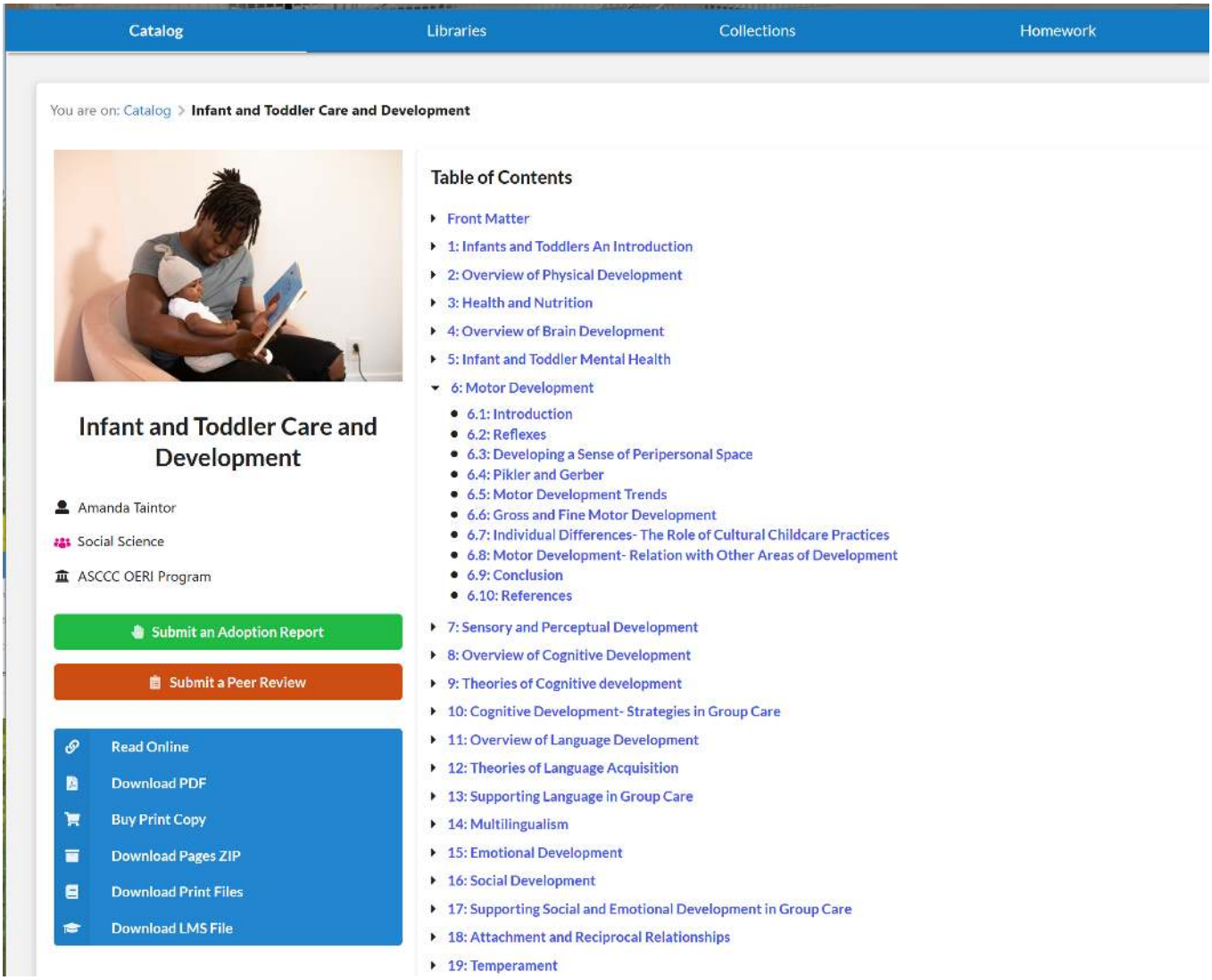
The catalog page is divided into two parts, the upper part allows searching for specific books, the lower provides links to individual books. If one expands the Advanced Search box



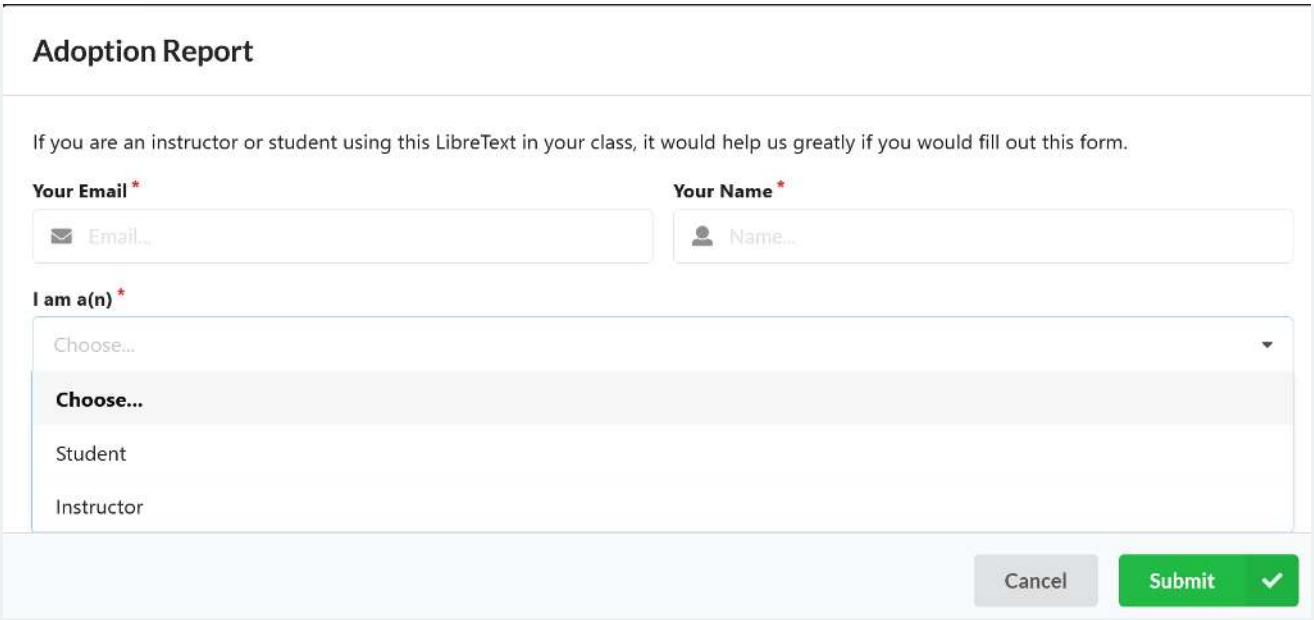
The default search is in the centrally curated Central Bookshelves of the libraries, which presently hold 1,159 books. If one is interested in a custom book on the Campus Bookshelves and makes that selection, today there are 897 books. You can also restrict the search to a specific library, a subject in that library, an author, a campus or a publisher.

Book Front Page

After a book has been located you can click on it to bring up more information on the book



Using the pane on the right one can quickly navigate to any page in the book. The blue box has selections to read the book from the beginning on line, download the complete PDF, buy a print copy through the LibreTexts bookstore, and download the Common Cartridge for integration of chapters and pages into an LMS. One can also submit an adoption report if the book is being used for a class, or a peer review.



After selecting student or instructor a few questions appear

Student

We are happy to hear that you are using LibreTexts in your classes.

How is this LibreText used in your class?

Choose...

Institution Name

Institution...

Class Name

Class...

Instructor Name

Instructor...

On a scale from 1 to 5, what is the quality of this LibreTexts content?

- ○
- ○
- ○
- ○
- ○

On a scale from 1 to 5, how easy is it to navigate the LibreTexts site?

- ○
- ○
- ○
- ○
- ○

How did you access this LibreText? (Select all that apply)

☐

☐ ☐ ☐ ☐

If you used a printed version of this LibreText, how much did it cost?

0

If you have additional comments, please share below

Comments...

Instructor

If you are using this LibreText in your class(es), please help us by providing some additional data.

Is your Institution part of the LibreNet consortium?

○

○

○

Class Name

Class...

If you have tought this class multiple times, please fill out this form for each.

When did you teach this class?

Choose...

Number of Students

0

Cost of textbook that LibreTexts replaced

0

In which ways did students use this LibreText in your class? (Select all that apply)

☐ ☐ ☐ ☐

If you used a printed version of this LibreText, how much did it cost?

0

If you have additional comments, please share below

Comments...

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SECTION OVERVIEW

10.2: Conductor

The Conductor is LibreTexts Project Building tool. It provides communication to the LibreTexts Administrators and among the users for construction and curation of their LibreTexts.

10.2.1: Conductor Home

10.2.2: Project

10.2.3: Ancilliary Materials and Team Members

10.2.4: Communications and Timeline

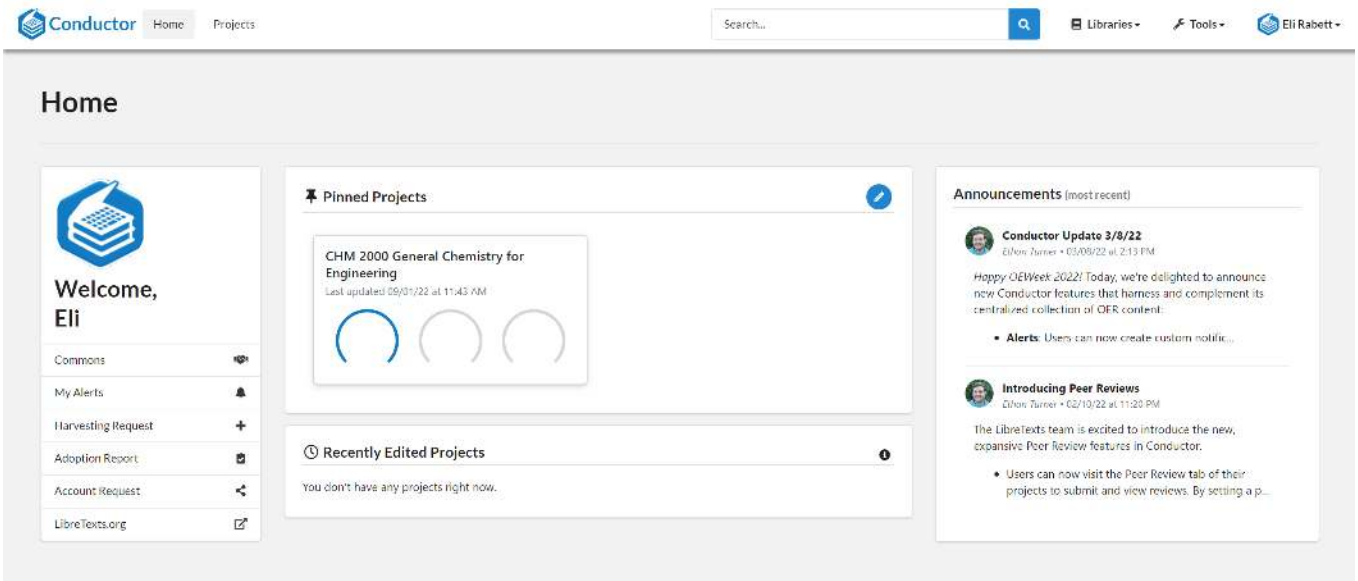
10.2.5: Peer Review

10.2.6: Accessibility Review

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10.2.1: Conductor Home

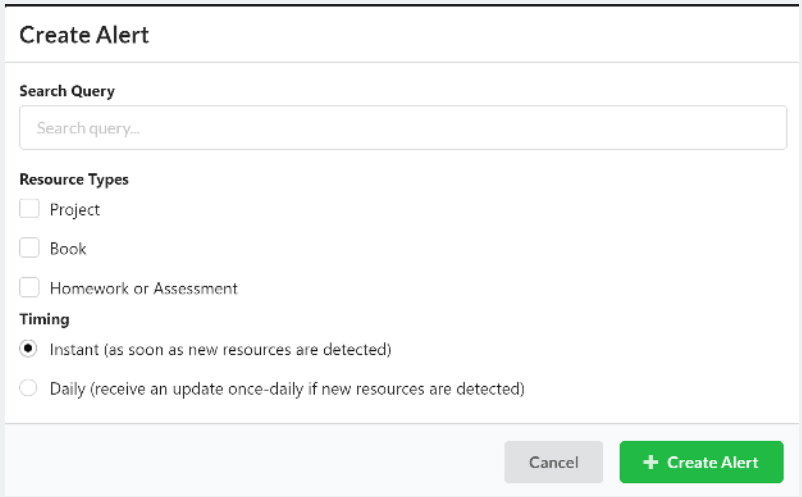
If you have logged in to the Conductor from the commons (discussed in the previous chapter) or go directly there, you will see a fairly simple page. Administrators will see a more complicated display which will be discussed later in this chapter



The list on the far left is a set of self explanatory links most of which have been discussed in the previous chapter with the exception of My Alerts and Harvesting Requests.

My Alerts are search terms that that you can set to be informed when something of interest to you has appeared on LibreTexts.

Create Alert



Harvest Requests are requests for integration of external OER that you would like to see integrated into LibreTexts, either for direct use or use in custom LibreTexts.

OER Integration Request

If you want to request an existing openly licensed resource be integrated into a LibreTexts library, please fill out and submit this form. This integration request will be tied to your Conductor account.

Resource Title

Title

Library Library...

Resource Format

We can integrate OER content from nearly any format, although content in some formats requires more effort to integrate than others. If the requested resource exists online please enter the URL below. If the content format requires submiting a file to us, let us know in the comments and we'll contact you with more details.

URL

URL

License License

Priority Integration

We try to prioritize integrating OER texts that people are ready to adopt in their classes. If you would like to use this text in your class you can fill out this section for priority consideration.

Your Institution

Institution

I would like to use this resource in my class: Use...

Date integration has to be completed for adoption to be possible:*

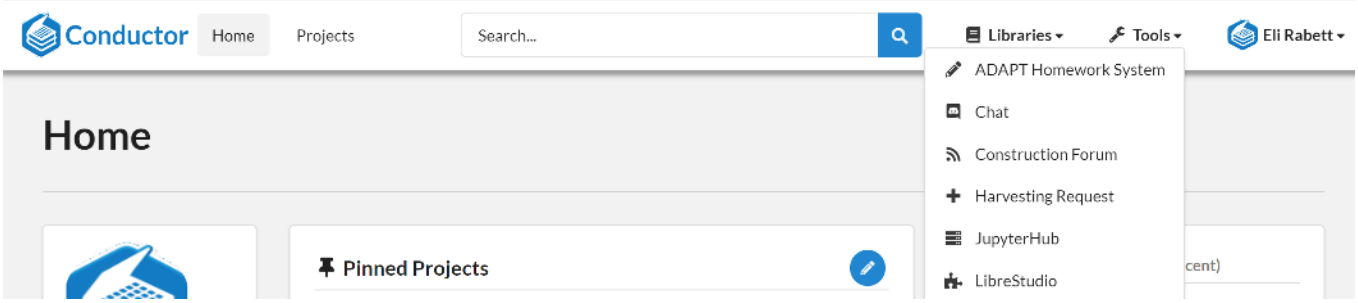
09-02-2022

**We try to integrate projects by the date they are needed but cannot guarantee this. If you have questions, you can always get in touch with the LibreTexts team.*

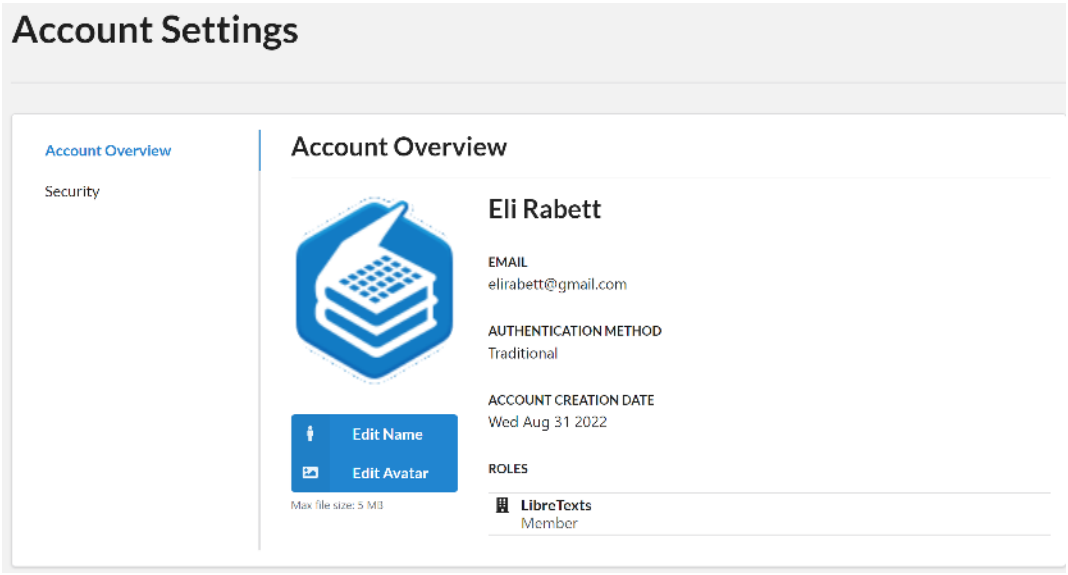
Do you want to be added to the project to observe and/or participate in the harvesting efforts?

Comments

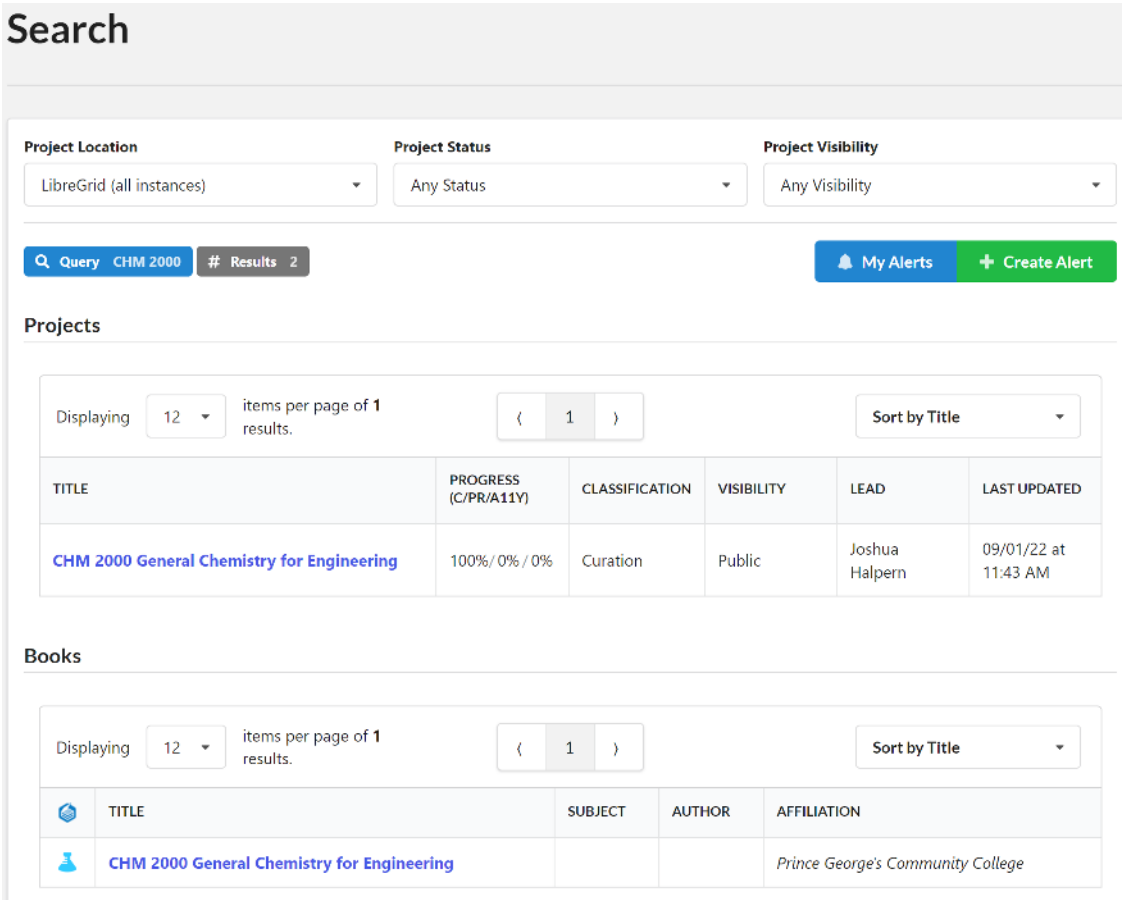
The top line in the Conductor is fairly self explanatory, Home is where you are now, Projects link you to your LibreTexts projects



Projects takes you to projects you are working on, the search bar lets you see all of the projects in the Conductor, Libraries are direct links to each of the LibreTexts libraries, Tools are links to various technologies, the constructions forum and chat (don't depend on that at the moment). Your avatar at the end on the far right is for Logging out and changing your account settings and security information.



At this point you should enter your project title, or a unique part of it into the search bar. Executing the search will produce a page for the search results



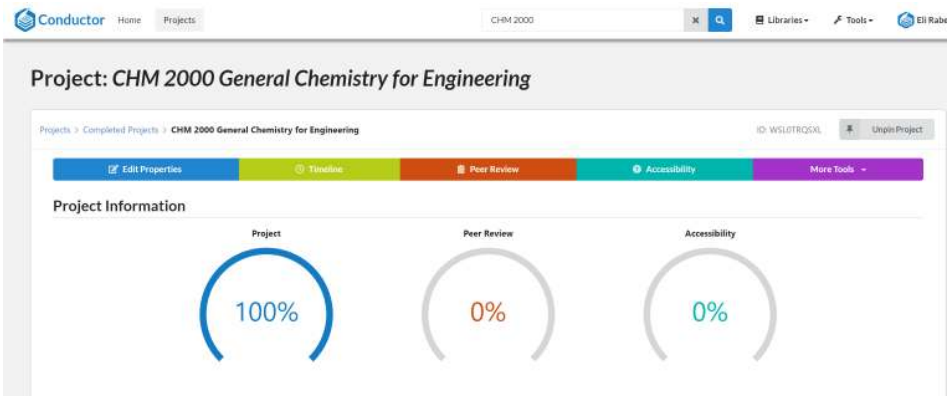
You can, if you wish search for the projects that anyone is working on by putting their name into the search bar.

At this point, if this is your first experience of the Conductor, you should move to the project by clicking on the title link.

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10.2.2: Project

We will discuss the project page starting at the top



The three broken circles are a quick visualization of the status of the project. In this case the project/book has been completed, but peer review and accessibility have not been done/completed. Timeline, Peer Review and Accessibility will be discussed in following pages. More Tools lets you pin this project so it appears on your home page. Edit properties brings up another page. You can edit any of the properties

Edit Project Properties

Project Properties

Project Title

CHM 2000 General Chemistry for Engineering

Current Progress

100

Peer Review Progress

0

Accessibility Progress

0

Status: Completed

Classification: Curation

Visibility: Public (within Conductor)

Project URL (if applicable)

https://chem.libretexts.org/Courses/Prince_Georges_Community_College/CHEM_2000%3A_Chemistry_for_Engineers_(S

Project Tags **Chemistry General Chemistry**

For settings and properties related to Peer Reviews, please use the Settings tool on this project's Peer Review page.

Homework and Assessments

Use this section to link your project's Commons page (if applicable) to an ADAPT assessment system course. Ensure the course allows anonymous users.

ADAPT Course URL (if applicable)

Enter ADAPT Course Dashboard URL...

Source Properties

Use this section if your project pertains to a particular resource or tool.

Author

Scott Sinex, Scott Johnson

Author's Email

sinexsa@pgcc.edu

License

CC-BY-NC-SA

Original URL

Enter resource URL...

Additional Information

Notes

Enter additional notes here...

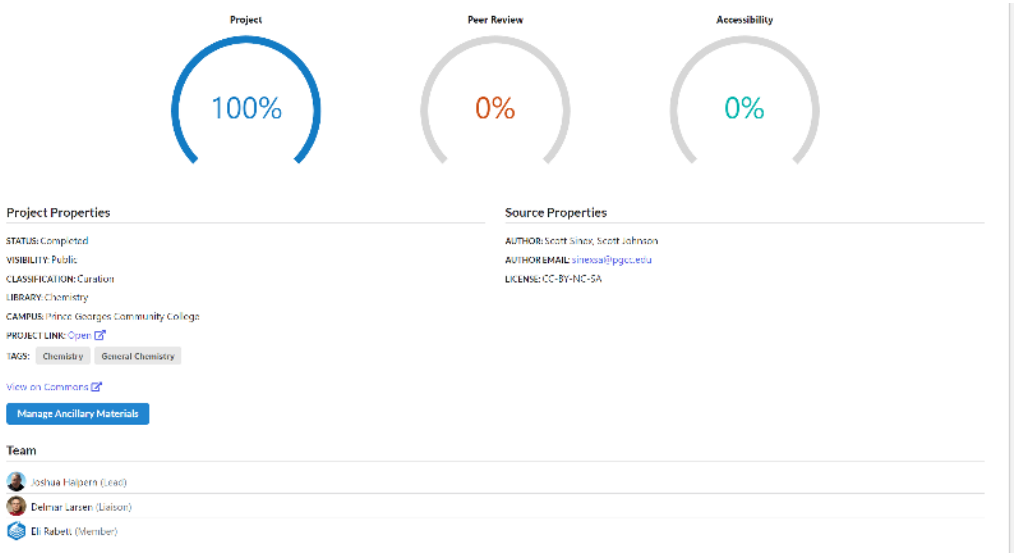
You **can ` `format` ` *your* notes!**

We now move on to the next section of the Project page

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10.2.3: Ancilliary Materials and Team Members

The next section of the Project Page is a listing of Project and Source Properties, a button to access and/or enter Ancillary Materials and a listing of team members. Team Leads and adminstraters can add or delete team members.



If you select Manage Ancillary Materials another form will appear. You can store any ancillary materials you wish here from your syllabus, slide decks, pdfs, etc. You can also control access to the materials. The URLs can be public or restricted.

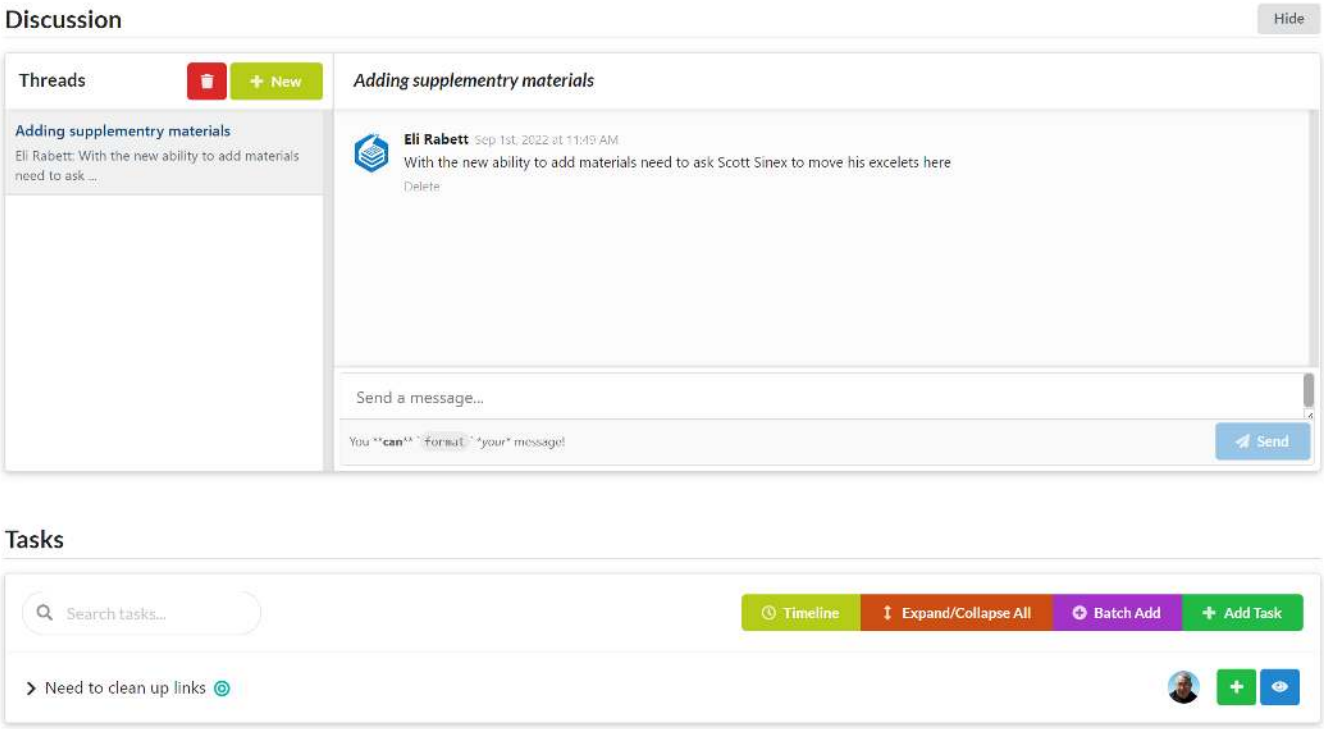


The next page describes how the Conductor manages team communications

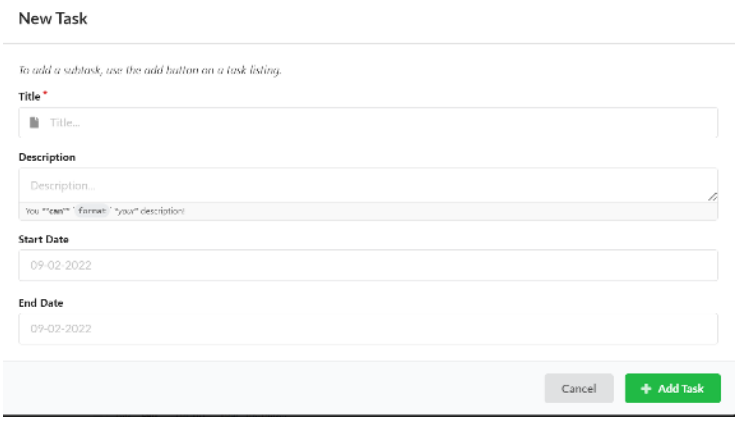
This page titled 10.2.3: Ancilliary Materials and Team Members is shared under a CC BY 1.3 license and was authored, remixed, and/or curated by Delmar Larsen.

10.2.4: Communications and Timeline

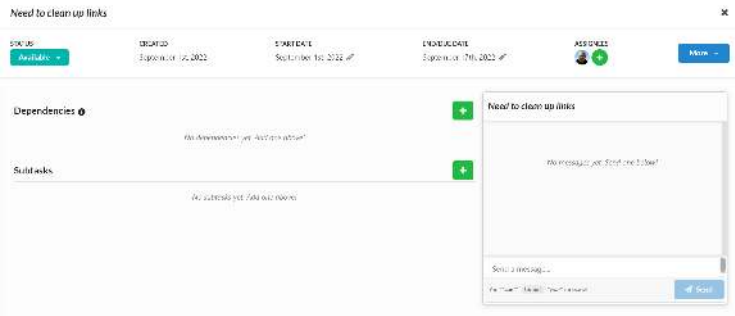
The next part of the Project Page is used for communication between team members and setting up timelines



Any member of the team can create a thread and send messages using the Discussion. Each message is sent to the registered email of team members. Tasks can be created using the Task bar. The timeline displays the task schedule either as a calendar or a Gannt chart.



Once set up subtasks can be added (the green + button) or the task can be edited (blue button with an eye on it)



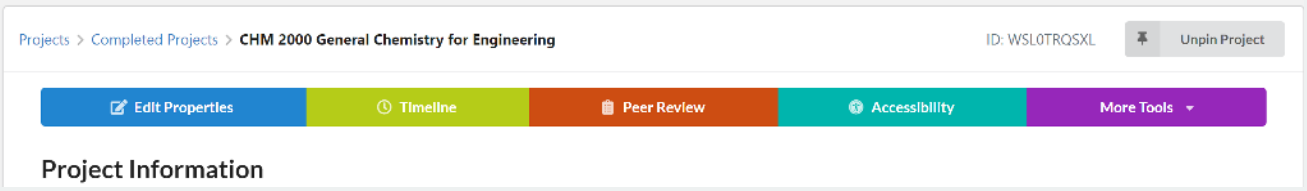
As appropriate, team members can be assigned to the task, status and dates changed, etc. Messages appropriate to the task can be communicated to people working on the task.

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10.2.5: Peer Review

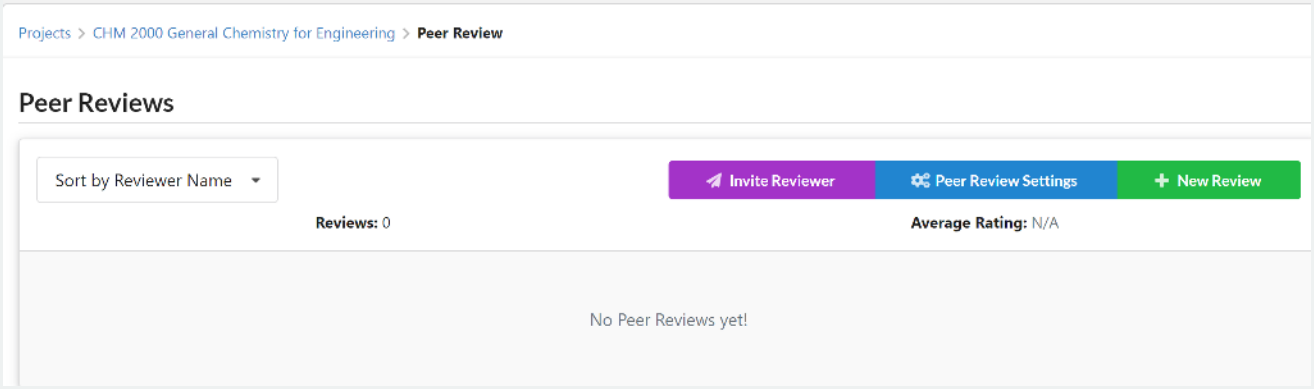
Peer Review is reached from the ribbon at the top of a Project page

Peer Review Button



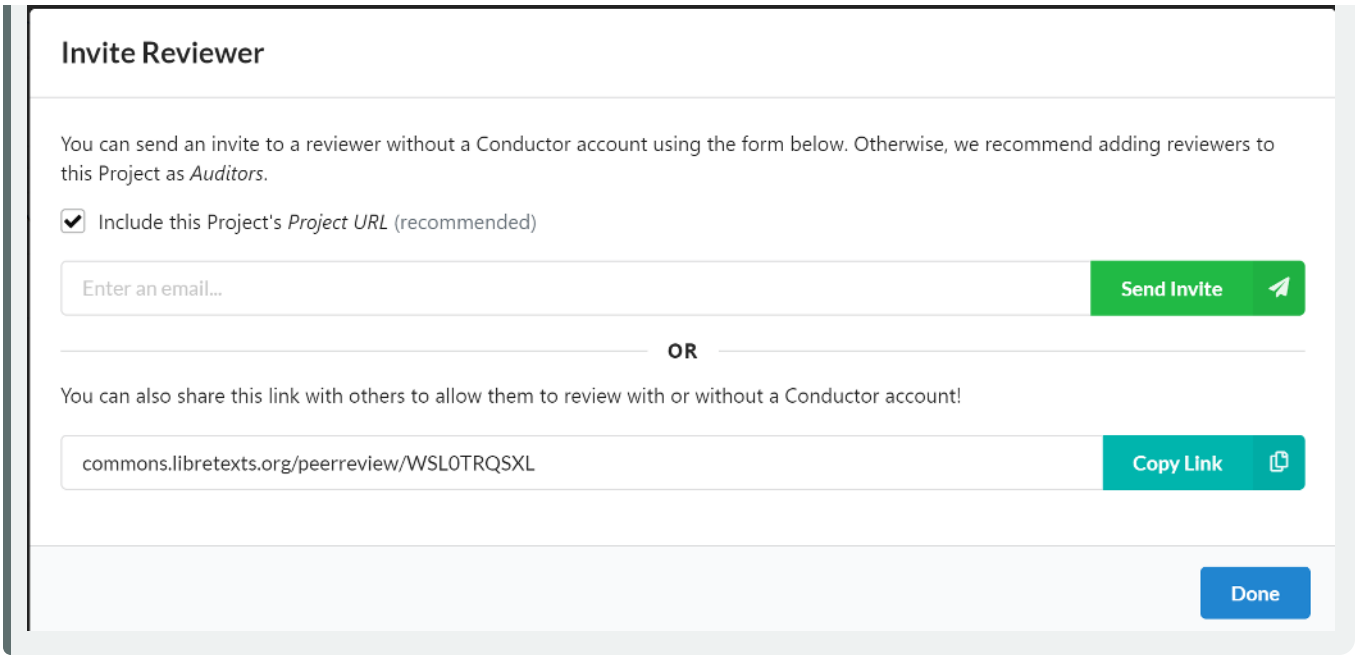
To reach

Note



After the reviews have been done they will be stored in the database and links will appear at the bottom of this form. You can invite others with or without Conductor accounts to do Peer Reviews

Invitation



In general one can use the default LibreTexts setting or one from Affordable Learning Georgia. The LibreTexts Peer Review form is found below

LibreTexts Peer Review

Your name will be attached to this Peer Review. ***Remember:*** *if this Project is 'Public' and attached to a LibreTexts resource, its Peer Reviews are visible to all. Your email remains private.*

Rubric: LibreTexts

First Name

Enter first name...

Last Name

Enter last name...

Email

Enter email...

I am a(n)

Choose...

Please rate this resource's overall quality:

The LibreTexts rubric is based on the Open Textbooks Review Criteria from Open Textbook Library, originally developed by BCcampus. It is licensed under a Creative Commons Attribution 3.0 Unported license.

Comprehensiveness

The text covers all areas and ideas of the subject appropriately and provides an effective index and/or glossary.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯ **Agree**
- ◯ **Strongly Agree**

Additional comments on Comprehensiveness

Enter your response...

Content Accuracy

Content is accurate, error-free and unbiased.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯ **Agree**
- ◯ **Strongly Agree**

Additional comments on Content Accuracy

Enter your response...

Relevance/Longevity

Content is up-to-date, but not in a way that will quickly make the text obsolete within a short period of time. The text is written and/or arranged in such a way that necessary updates will be relatively easy and straightforward to implement.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯

Agree

Strongly Agree

Additional comments on Relevance/Longevity

Enter your response...

Clarity

The text is written in lucid, accessible prose, and provides adequate context for any jargon/technical terminology used.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

Additional comments on Clarity

Enter your response...

Consistency

The text is internally consistent in terms of terminology and framework.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

Additional comments on Consistency

Enter your response...

Modularity

The text is easily and readily divisible into smaller reading sections that can be assigned at different points within the course (i.e., enormous blocks of text without subheadings should be avoided). The text should not be overly self-referential, and should be easily reorganized and realigned with various subunits of a course without presenting much disruption to the reader.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯ **Agree**
- ◯ **Strongly Agree**

Additional Comments on Modularity

Enter your response...

Organization/Structure/Flow

The topics in the text are presented in a logical, clear fashion.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯ **Agree**
- ◯ **Strongly Agree**

Additional comments on Organization/Structure/Flow

Enter your response...

Interface

The text is free of significant interface issues, including navigation problems, distortion of images/charts, and any other display features that may distract or confuse the reader.

- ◯ **Strongly Disagree**
- ◯ **Disagree**
- ◯ **Neutral**
- ◯

Agree

Strongly Agree

Additional Comments on Interface

Enter your response...

Grammatical Errors

The text contains no grammatical errors.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

Additional comments on Grammatical Errors

Enter your response...

Cultural Relevance

The text is not culturally insensitive or offensive in any way. It should make use of examples that are inclusive of a variety of races, ethnicities, and backgrounds.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

Additional comments on Cultural Relevance

Enter your response...

Additional Comments

Please enter any additional comments here.

Enter your response...

Affordable Learning GA Peer Review

Preview Peer Review

Your name will be attached to this Peer Review. ***Remember:*** *if this Project is 'Public' and attached to a LibreTexts resource, its Peer Reviews are visible to all. Your email remains private.*

Rubric: Affordable Learning Georgia

First Name

Enter first name...

Last Name

Enter last name...

Email

Enter email...

I am a(n)

Choose...

Please rate this resource's overall quality:

This rubric is based on OER evaluation criteria from Affordable Learning Georgia. It is licensed under a Creative Commons Attribution 4.0 International license.

Clarity, Comprehensibility, and Readability

- [ ] **Is the content, including any instructions, exercises, or supplemental material, clear and comprehensible to students?**
- [ ] **Is the content well-categorized in terms of logic, sequencing, and flow?**
- [ ] **Is the content consistent with its language and key terms?**

Content Accuracy and Technical Accuracy

- [ ] **Is the content accurate based on both your expert knowledge and through external sources?**
- [ ] **Is the content free of any factual, grammatical, or typographical errors?**

- [ ] **Is the interface easy to navigate? Are there broken links or obsolete formats?**

Adaptability and Modularity

- [ ] **Is the resource in a file format which allows for adaptations, modifications, rearrangements, and updates?**
- [ ] **Is the resource easily divided into modules, or sections, which can then be used or rearranged out of their original order?**
- [ ] **Is the content licensed in a way which allows for adaptations and modifications?**

Appropriateness

- [ ] **Is the content presented at a reading level appropriate for higher education students?**

How is the content useful for instructors or students?

Enter your response...

- [ ] **Is the content itself appropriate for higher education?**

Accessibility

- [ ] **Is the content accessible to students with disabilities through the compatibility of third-party reading applications?**
- [ ] **If you are using Web resources, does each image have alternate text that can be read?**
- [ ] **Do videos have accurate closed-captioning?**
- [ ] **Are students able to access the materials in a quick, non-restrictive manner?**

See Affordable Learning Georgia's Accessibility Guides page for more details.

Supplementary Resources

- [ ] **Does the OER contain any supplementary materials, such as homework resources, study guides, tutorials, or assessments?**
- [ ] **Have you reviewed these supplementary resources in the same manner as the original OER?**

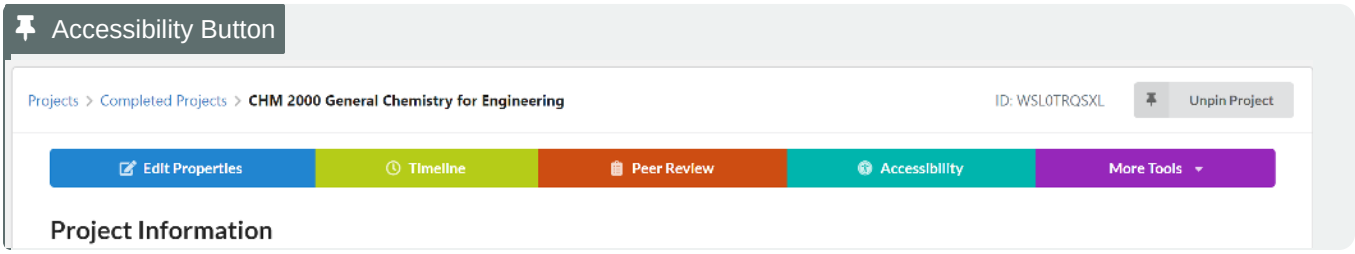
Additional Comments

Please enter any additional comments here.

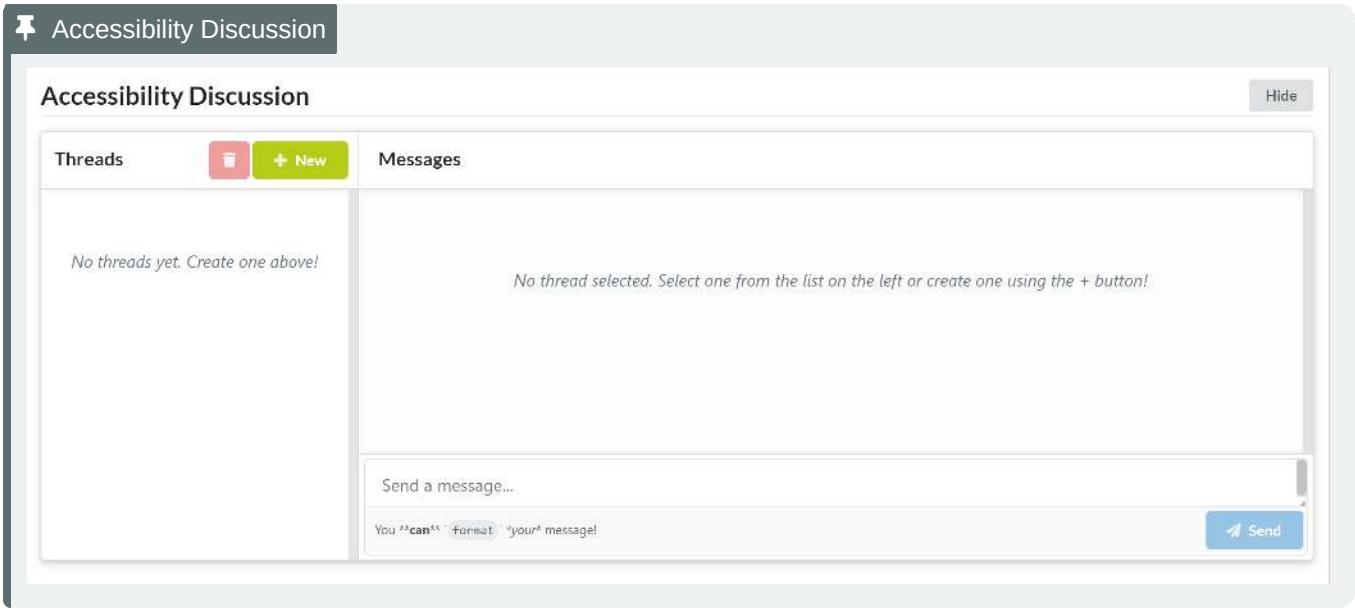
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10.2.6: Accessibility Review

The conductor provides a checklist for a complete manual peer review, but many of the categories can be done using a software bot that is under construction. If you select Accessibility Check in the Project Ribbon



you will move to the Accessibility Check Page. The top of the Accessiblity Check Page is a Discussion area which is similar to the others in each LibreTexts Project Page



the bottom is the Accessibility Complicance Review Matrix which has 35 checks for each page

Images		
Do all images have meaningful alt text?	For images not requiring alt text, is it marked as decorative?	Is all alt text under 150 characters? (Consider a caption instead)

Links		
Removed all empty links?	Removed all Suspicious Link Text?	Are URLs outside of LibreTexts labelled properly? (third party URL destination)

Contrast		
Is text contrast 4.5:1 for text 18pt and smaller?	Is text contrast 3:1 for text over 18pt?	Do graphical links/buttons have 3:1 contrast ratio?

Text				
Is all text larger than 10pt?	Alter text size? Keep line height at least 1.5 times the font size.	Alter text size? Spacing following paragraphs is 2x the font size.	Alter text size? Letter spacing is 0.12 times the font size.	Alter text size? Word spacing is 0.16 times the font size.

Headings		
Alter text size? Word spacing is 0.16 times the font size.	There are no empty headings	Heading Outline

Forms	
Do form fields have a label?	Can you navigate questions and answered radio buttons?

Tables		
Do tables have column and row headers?	Are the tables labeled?	No tables are embedded as images

Lists	
Are ordered lists properly labeled?	Are unordered lists properly labeled?

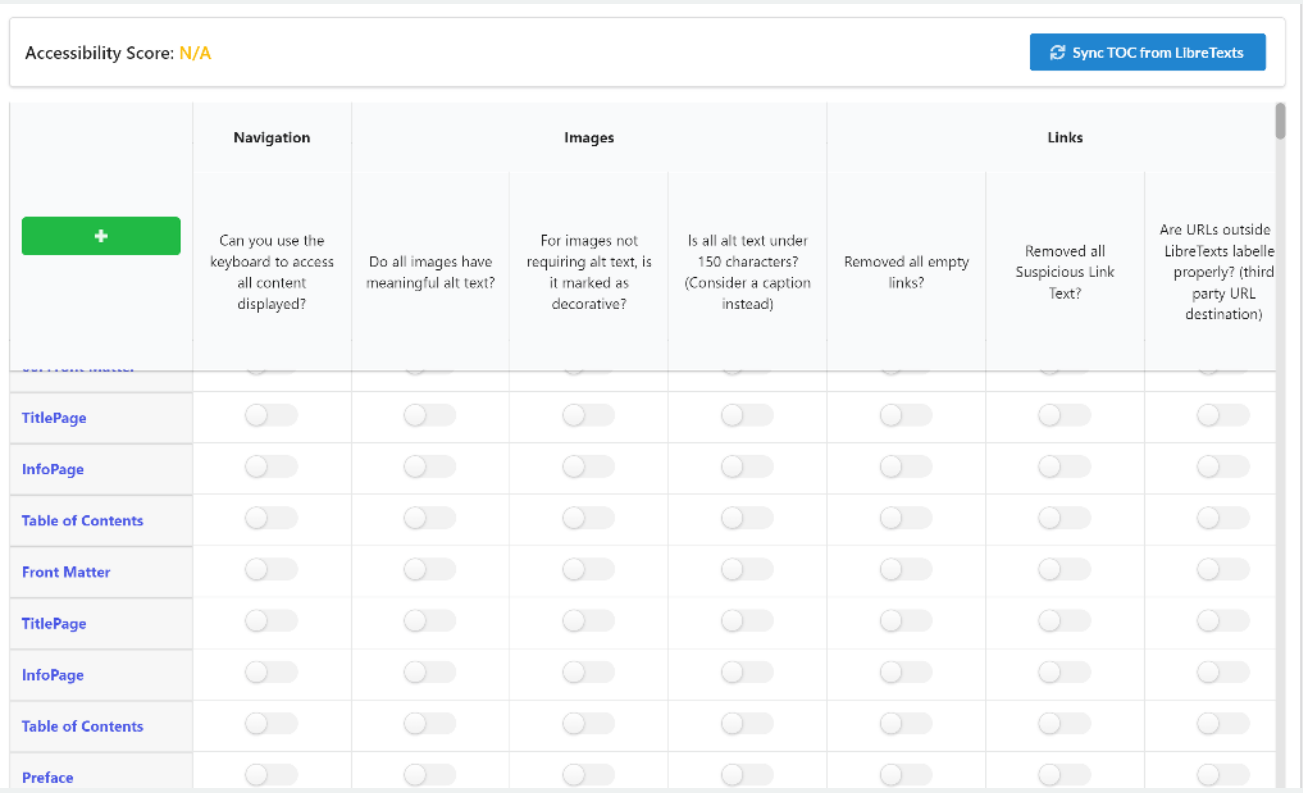
Documents	DIV
Does document link make sense and followed up with (FILETYPE)?	Is the document accessible?

Multimedia			
Does the video have captions?	Can you navigate the video player controls?	If no transcript, does the audio have a transcript?	Does the video have audio descriptions or a media alternative if necessary?

Navigation	DIV	Sensory Characteristics	Timing	Computer Code
Can you use the keyboard to access all content displayed?	All DIV boxes are converted to SECTION LANDSCAPE	Instructions provided for interactive content do not rely solely on shape, color, size, visual location, orientation, or sound	Time limits meet criteria	Inserting code for review? Ensure that characters and spaces are included as alt text for screenreaders.

The compliance matrix can be synched to the books using the blue button on the far right

Accessibility Matix for Each LibreTexts Book



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SECTION OVERVIEW

10.3: Conductor for Admins

10.3.1: Control Panel

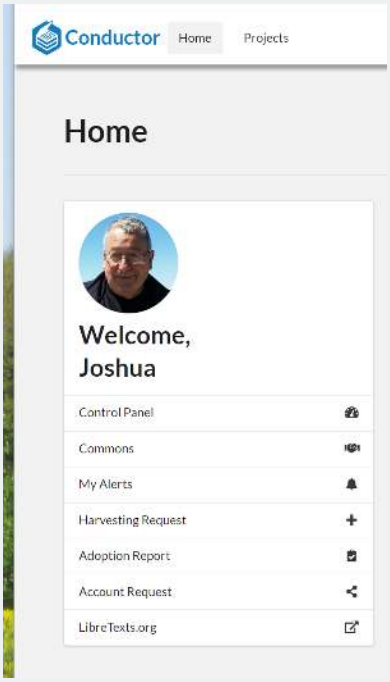
10.3.2: Project Page for Administrators

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10.3.1: Control Panel

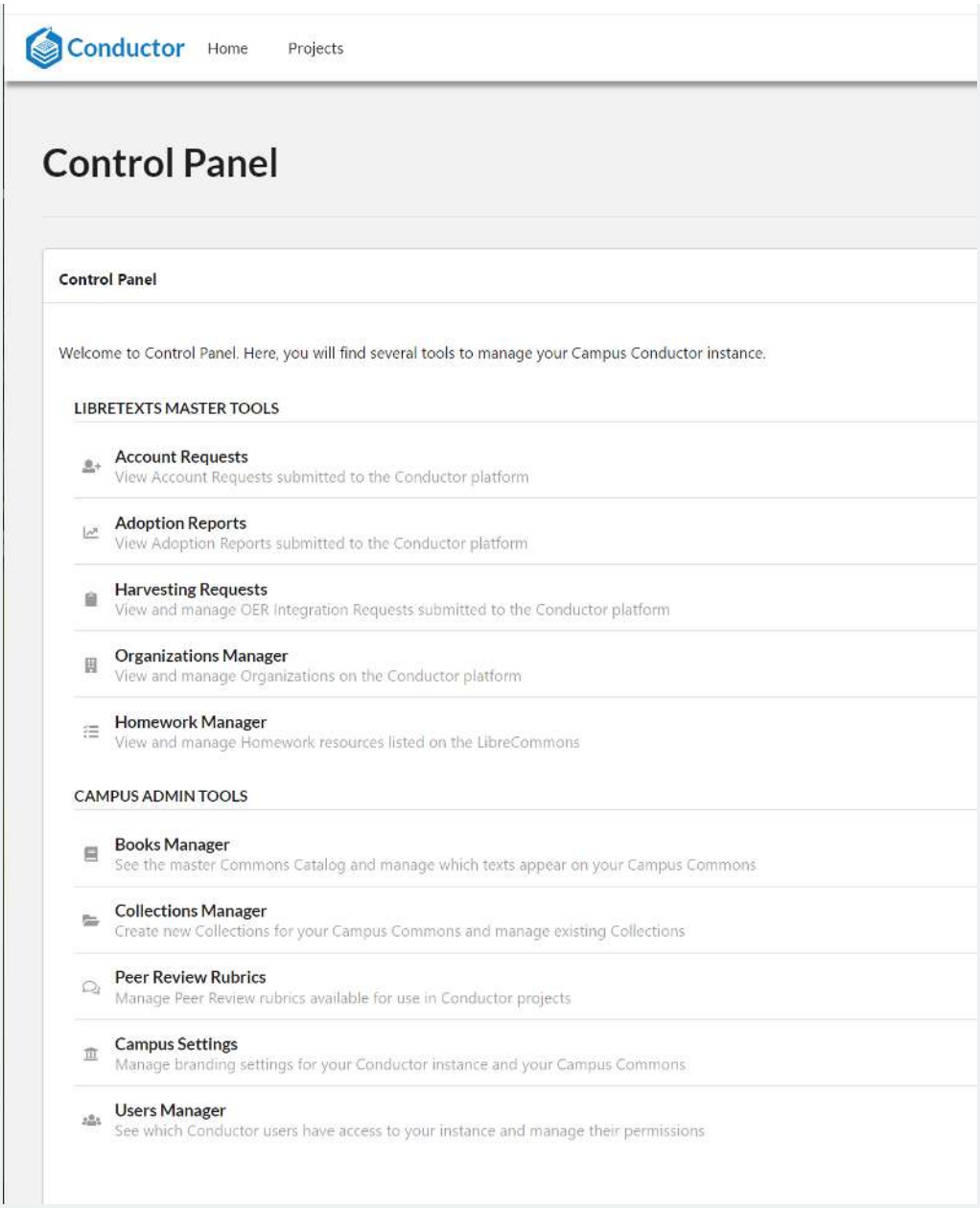
For administrators there is an additional choice of Control Panel at the top of the right hand menu when they login to the Conductor

Home



The Control Panel provides LibreTexts and Campus administrators tools to manage their Conductor instances.

Control Panel



Master Tools Panel

The first three tools in the Master Tools panel access databases populated from forms accessible in the conductor,

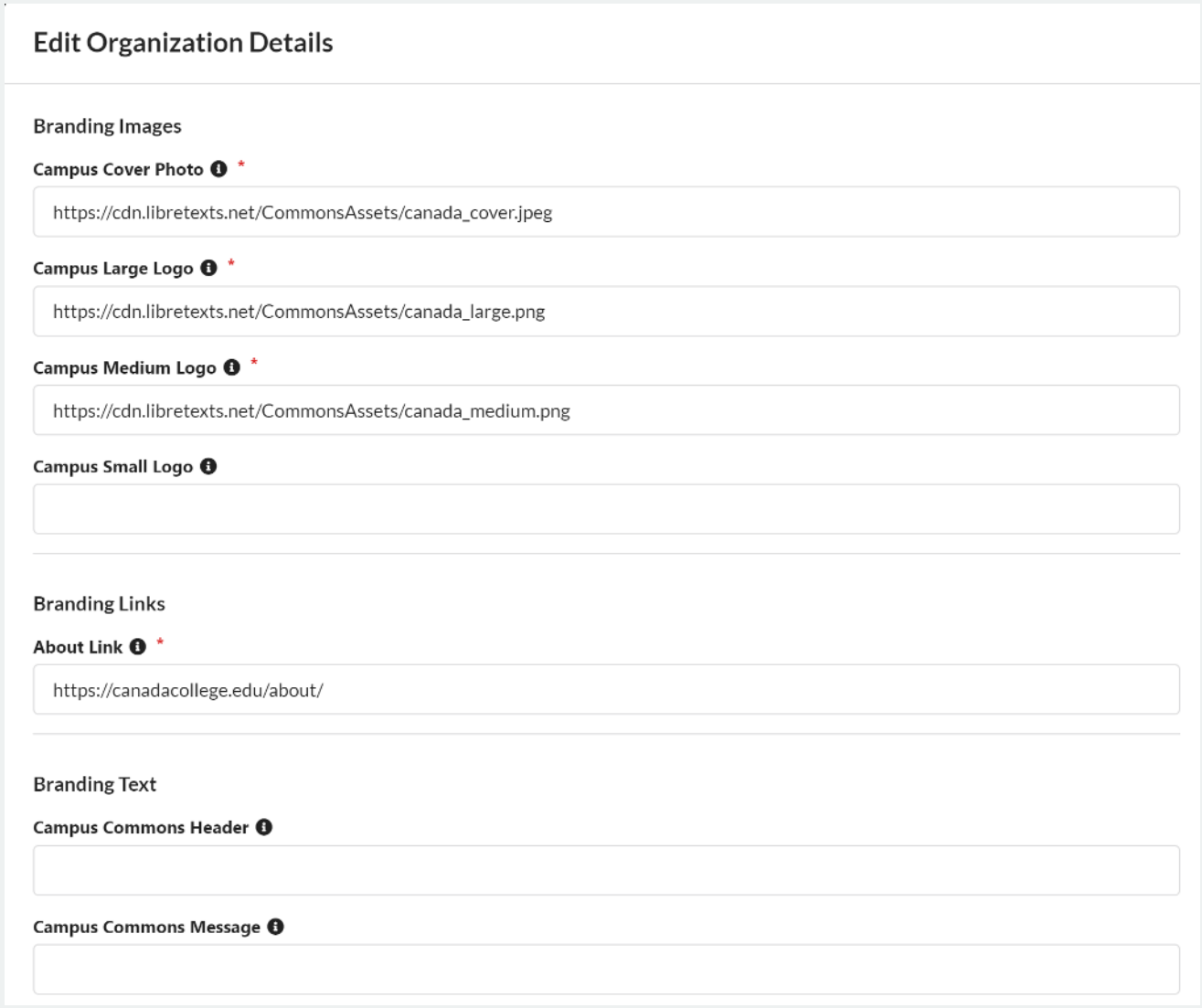
- **Account Requests** View Account Requests submitted to the Conductor platform described here
- **Adoption Reports** View Adoption Reports submitted to the Conductor platform described here
- **Harvesting Requests** View and manage OER Integration Requests submitted to the Conductor Platform described here

The last two tools are controlled through the Master Tools Panel

- **Organizations Manager** View and manage Organizations on the Conductor platform
- **Homework Manager** View and manage Homework resources listed on the LibreCommons

The Organization Manager has the branding information entries for every LibreNET member organization.

Note

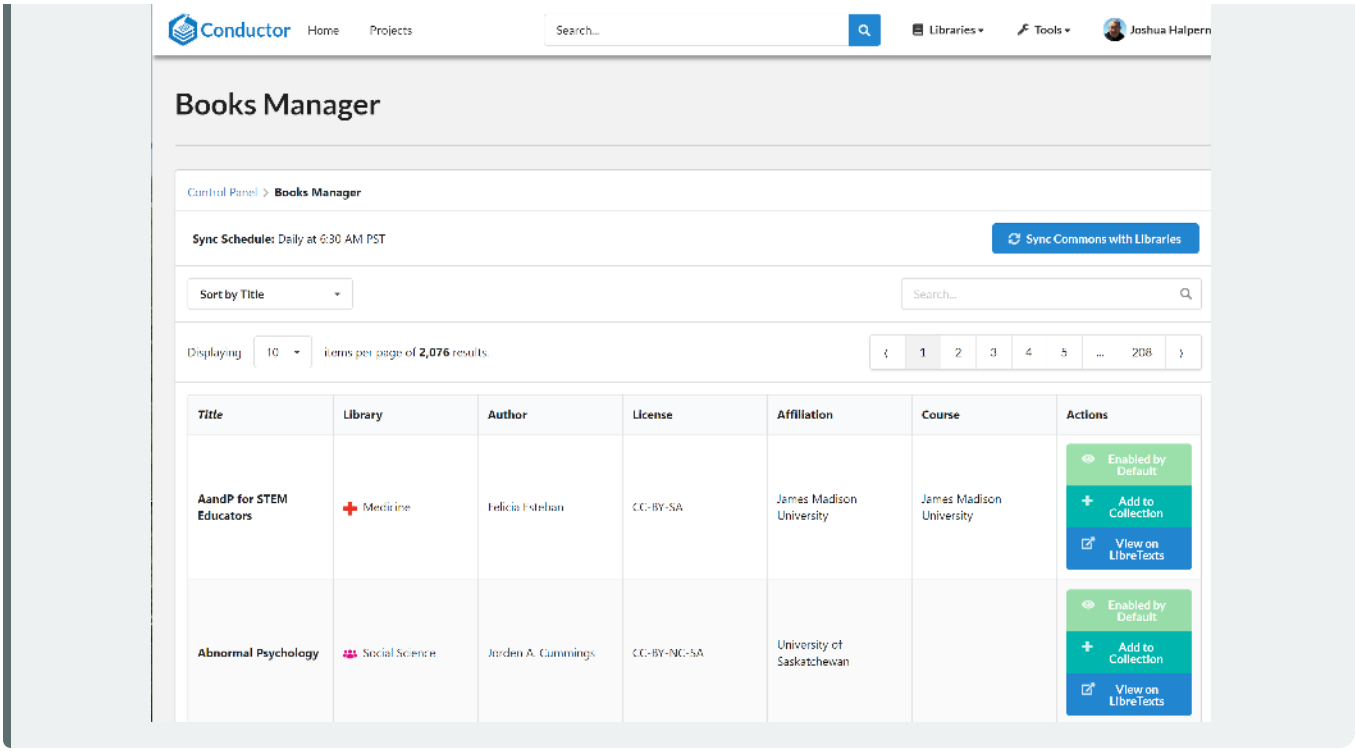


The Homework Manager is the database which populates the Homework dropdown in the Commons Blue Bar. It is synched daily at 12:30 AM PST to entries in the ADAPT Homework System.

Campus Admin Tools

The Books Manager is the database which populates the Commons Catalog. It is synched daily at 6:30 AM PST to the Libraries

Books Manager



Collections Manager is the database that manages Collections displayed through the Collections tab on the Commons Blue Bar. Administrators have the option to manage collections, adding or removing LibreTexts.

Campus administrators can use the Peer Review Rubric tab on the Campus Admin Tool Panel to specify/create a campus peer review rubric that will be used for all Campus Books.

The Campus Settings is the database that manages organizational details for LibreNET members which have their own branded Campus Commons. To access this Campus Admins need to first select their Campus Commons in the LibreTexts Commons before logging in to the Conductor.

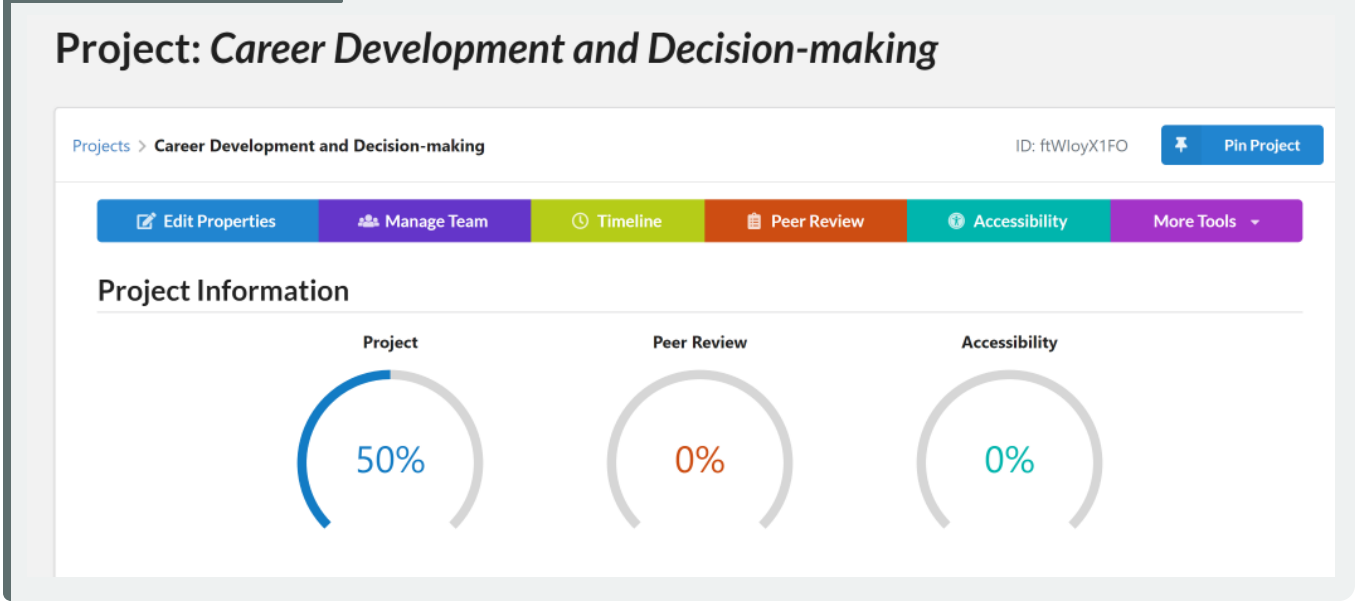
User Manager is a database of all Conductor users which provides information about the projects they are working on.

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10.3.2: Project Page for Administrators

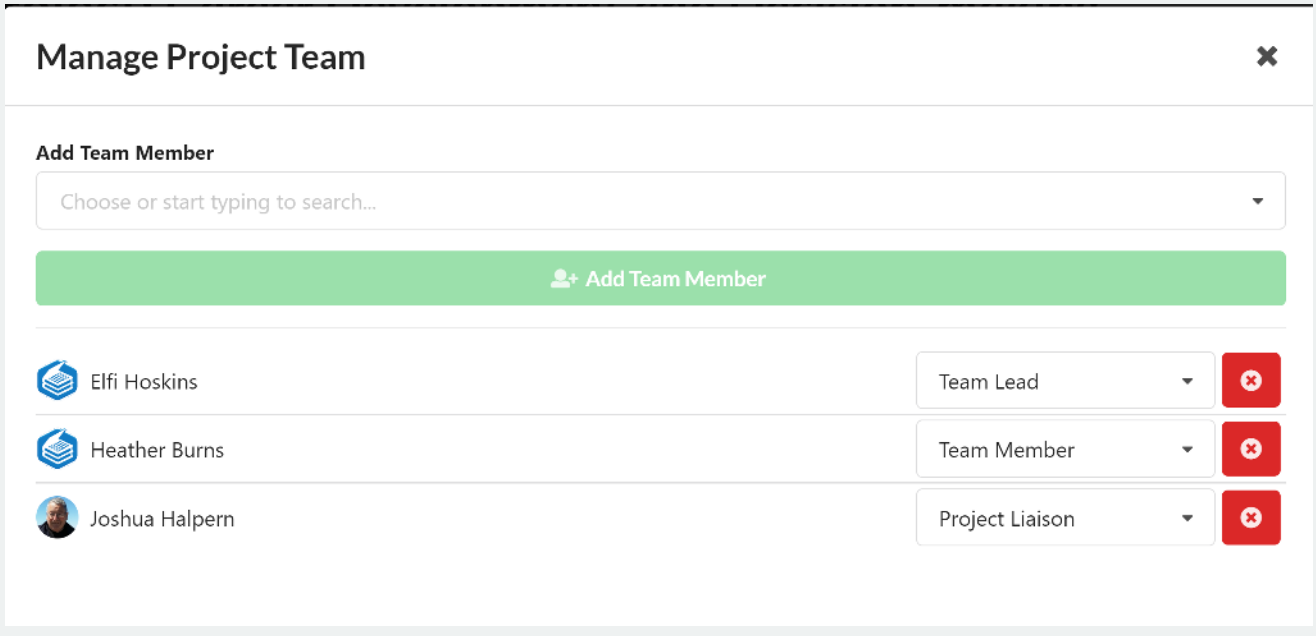
The difference for administrators on the Project Page is the ability to build teams using the Manage Team button

Project Page for Admins



Pressing on that button brings up a simple page

Note



Admins can remove team members and designate their roles. At least one LibreTexts Admin should be the Project Liason. You can add members to the team by starting to type their names in the Add Team Member box at which point a list of people with that name will appear underneath the selection box and they can be added to the team.

For further details refer to the Project Page chapter.

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C

content, architecture, and pedagogy (CAP) framework
2.1: What is the framework for design?

H

here
5.2.6: How to Incorporate Data Files in Your Code Blocks- For SageMath

Glossary

Sample Word 1 | Sample Definition 1

https://chem.libretexts.org/@go/page/283876

Detailed Licensing

Overview

Title: LibreTexts Construction Guide 1e

Webpages: 128

All licenses found:

- CC BY 1.3: 93% (119 pages)
- CC BY 4.0: 7% (9 pages)

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