Earth Exploration Toolbook
Chapter Author’s Guide

Chapters in the Earth Exploration Toolbook (EET) are similar to recipes in a cookbook—each chapter walks the user through gathering the necessary ingredients and putting them together in a specific way to produce a map, image, graph, or other data product.

This document presents guidelines and advice for creating an effective chapter that will be consistent with the rest of the EET. Throughout the document, we’ve used recipes and cookbooks as analogies for chapters in the Toolbook. Even if you don’t know your way around a kitchen, we hope the comparisons will help clarify our goals for EET chapters.

**Why would you write an EET Chapter?**

- Do you know of data or a data analysis tool that can illuminate a fundamental or advanced concept in Earth system science in an especially elegant way?
- Do you have a practical demonstration of a data analysis technique that could explain some Earth system research to a novice data user?
- Is there a classic Earth system science lesson that you can bring to life by accessing and analyzing data?

These are examples of procedures that could serve as core activities for chapters in the EET. By writing an EET chapter, you can share data use skills with teachers and students, helping them to become comfortable users of data and data analysis tools.

**Defining your chapter**

Begin by identifying a clear example of some data or tool’s power, or with an important concept that can be illustrated through data analysis. Brainstorm at least a couple approaches to the topic. Confirm that your idea is possible and reasonably practical by working through the procedures yourself.

Take into account the fact that teachers have a high value for lessons that address classic science concepts. These concepts appear with predictable regularity on college course syllabi, and show up in the National Science Education Standards (NSES) for K-12 students.

- [http://pals.sri.com/pals/standards/njes5-8text.html](http://pals.sri.com/pals/standards/njes5-8text.html)

The current national trend of requiring students to pass high-stakes tests for high school graduation has forced K-12 teachers to focus on covering the enumerated standards, leaving little time for more peripheral concepts. Thus, the chapters that
would be most attractive to these teachers are the ones that demonstrate good alignment with science teaching standards. Also, give careful consideration to other methods that are commonly used to teach the concept you’ve identified. Assess if using data truly is a better, cheaper, faster, or more effective way to teach that content for some part of the population or in some circumstances.

**Compelling case studies**

In EET chapters, we strive to show the use of data and tools within a compelling case study. An interesting and scientifically valid storyline can provide motivation for students and teachers to perform data manipulations and analysis procedures. Without an interesting story behind the steps, some users might just as well perform the procedures outlined in a software manual.

**Examples to admire**

Every day, NASA’s Earth Observatory ([http://earthobservatory.nasa.gov/](http://earthobservatory.nasa.gov/)) posts a dandy example of a data-supported story that could serve as the case study of an EET chapter. EO’s daily feature presents a data image and a brief story about someone’s interpretation of the data. A yearly compilation of these professionally written data-supported stories is available in NASA’s DAAC yearbooks: ([http://nasadaacs.eos.nasa.gov/newsfeatures.html](http://nasadaacs.eos.nasa.gov/newsfeatures.html))

We’re not suggesting that EET chapters must have a professional-quality article for their case studies—we’re pointing these out as good examples of what the scientifically minded public apparently values, stories showing how data analysis can illustrate or illuminate issues that affect human lives.

Often, data providers and tool builders can build up some situational background around their favorite demonstrations to develop a case study. Building a story around a demonstration might also be accomplished by focusing on data from an interesting place or a noteworthy event. Comparing data from two or more locations or looking at the difference between average data and data from a specific time period is another technique that might provide a storyline. The goal of the case study is to give users an appreciation for what the data analysis means for humans.

**Scaling your chapter appropriately**

Consciously or unconsciously, potential users of EET chapters will do a cost-benefit analysis as they scan each chapter, comparing the number and complexity of steps they must perform with the value of the product they will produce. If the potential product is so large and wonderful that it seems unattainable, few people will make the attempt. Conversely, if someone is going to go to a lot of trouble to make something, the product should have some obvious value.

Consider the cookbook analogy…

Envision a moderately experienced cook browsing through recipes, searching for something interesting to prepare and serve at a dinner party. The cook might look for something new and unique, but they would probably steer clear of dishes that were so complex that the risk of failure was large.
Settle on an attainable yet worthy product for your chapter. If your project is very large, you can always reduce its scale and write a sequel to your first chapter later. A more limited chapter will be more successful in persuading folks to take the first step of working with the data. Also, though you may be an expert with a particular set of data and/or tools, it’s important not to overwhelm novice users with more information than they need. Limit the background information and new science content in your chapter to the topic at hand.

Another consideration in defining the scope of your chapter is the specific data-using skills that teachers and students need to develop. The following recommendations for developers are from the Using Data in the Undergraduate Classroom Report.

Within data-rich educational modules, students need to be able to:
• Find and access data relevant to the topic they are investigating
• Evaluate the quality of this data
• Manipulate data to answer questions
• Combine data sets to solve a central problem
• Generate visualizations and representations that communicate interpretations and conclusions
• Contribute student data to larger data sets
• View individual student data in the context of larger data sets

It’s not likely that a single chapter would cover all of these items, but the list does provide some guidelines for the kinds of skills chapters should address.

Finally, keep in mind that instructors at all levels like to adapt resources to fit their own specific situations. Within reason, build in the flexibility for users to access similar data for a different location or time within your chapter. The data you feature in your chapter may end up serving as a model or demonstration set, essentially teaching users to perform similar analyses on other datasets.

**EET’s Target User**

EET chapters are designed for a generally computer literate audience. To encourage consistency across chapters, consider this profile of our fictitious target user:
• a high school science teacher
• studied science in college, but did not have a graduate school/research experience
• is a relatively early adopter of new technologies
• routinely uses email, Web browsers, and word processing applications plus some record keeping program for student grades
• is familiar with spreadsheet functionalities but has rarely built their own spreadsheet or database files
• understands general computer functions such as opening, saving, and renaming files, and navigating to different folders or directories to access specific information
• is not especially knowledgeable about file types and extensions (needs to be told which files require special handling such as decompression or conversion, or which must be opened from within a specific application)
Getting ready to write
Examining a completed EET chapter is the best way to get an overview of the chapter structure and understand the purpose of each section. Go to http://serc.carleton.edu/eet/chapters.html and peruse any of the available chapters to get a feel for the chapter format. You’ll notice that the main substance of the chapter is in the Case Study and the Step-by-Step Instructions. Other pages such as Teaching Notes and About the Tool and Data contain useful information, but don’t require the same level of planning and development.

Developing the instructions
Once you’ve settled on the topic for your case study, make an outline of the major tasks it will take to perform the data analysis from beginning to end. You’ll expand on this outline to three levels: the major tasks become the Parts of the chapter, the actions it takes to complete each part are called Steps, and the particulars of each step are referred to as Details.

Note: Developers usually begin chapter development in a word processing document or on paper. Flexibility is important and multiple changes are the rule rather than the exception. Once the outline is fairly well developed, but before you begin the actual writing of instruction text, consult the EET Template Fields Description document. This document describes the information you’ll enter into the template fields to build your chapter.

Step-by-step Instructions page
The Step-by-Step Instructions page actually provides an overview of what it’ll take to complete the entire project. Some examples of these large-scale, multi-step tasks are

• Access or download an analysis tool
• Obtain data for a specific time or place
• Manipulate the tool to perform some analysis procedure
• Interpret the results of your analysis

These tasks will be the main Parts of your chapter, listed on the Step-by-Step Instructions page. Chapters usually have from 3 and 5 parts, but can contain up to 6. Each Part should have an obvious outcome, ending at a natural break in the action.

In our food preparation analogy, the Step-by-Step Instructions page is analogous to the outline for preparing a multi-step dish—a listing of the main components of a dish that must be prepared separately and then combined.

For example, here are the Parts you might see for a recipe to make a special fruit salad.

1. Make lemon sauce
2. Prepare whipped topping
3. Peel and cut fruit
4. Combine and serve

Each of the tasks requires further instructions, but the outline helps organize the cook’s efforts by chunking the job into discreet parts.
Part pages
Each Part of the chapter requires the user to complete a sequence of **Steps** to complete the Part’s major task. Steps should be described with enough detail so that users who are familiar with the application or tool can perform the action without further help. All necessary information such as links to follow, paths to navigate, or dialog box settings to use should be evident in the Step description.

In addition to describing the Steps, Parts pages deliver the science content of the chapter. Content should appear in fairly brief text blocks that inform the user about science concepts related to the technology instructions and data manipulations they are performing. Content comments can precede or follow the technology instructions, depending upon if the text explains what the user is about to do, or if it focuses on helping the user interpret the result of an action they just completed.

**Steps** are analogous to the directions for preparing separate components of a dish. For example, the **Steps** for Part 1, Make lemon sauce, in the special fruit salad recipe from above might be

1. Melt 1/4 c. butter in saucepan
2. Add 1/2 c. granulated sugar
3. Add 1 c. water
4. Add 1 tsp. corn starch
5. Bring to slow boil
6. Boil until thickened then remove from heat
7. Add 1/4 c. lemon juice
8. Add zest of one lemon

Developers often identify some number of Steps for a Part, then find they need to increase that number because they want to split out some smaller tasks from the original steps. When describing a sequence of procedures in writing, even the very slightest steps must be made explicit, so the number of steps tends to increase during development (this is one of the best reasons to get chapters fairly well developed in a word processing document before entering them into the EET page templates).

To keep users moving through a chapter, no Part should have more than 8-10 Steps. If you find yourself needing that many steps, consider splitting the Part into more than one task, or lumping some of the closely related steps together.

Science content comments interspersed among the Steps in a chapter are similar to the “About...” sections that provide background information about specific ingredients in one of our favorite cookbooks, *The Joy of Cooking*. For instance, the lemon sauce recipe above might have a sidebar comment telling cooks how to keep the sauce free of lumps and reminding them to cook the sauce thoroughly enough to avoid any raw taste from the corn starch. A cook could prepare the recipe without this information, but their knowledge (and their sauces!) can be enhanced when they use this information.
Details
Some users prefer to have every single step of a new technology process spelled out for them—this kind of user wants to walk through the chapter in a lockstep fashion, mentally checking off each procedure as it is completed. EET chapters offer this level of detail without cluttering the instructions for more confident users. Details are provided as hidden text immediately following the Step they clarify.

Recall that each Step provides enough information for the competent user to perform the Step. In the Details however, you’ll spell out a fairly complete sequence of the actions that users should follow. You’ll also provide screenshots that highlight the buttons, controls, or fields to complete so users have a visual to check their own progress. In developing the Detailed instructions, expert data users often omit small steps that they perform without thinking about them. Watching a novice data user struggle when the details are not complete will help you see how explicit your details must be.

Details are similar to cookbook sections that provide information on a specific preparation technique. In the lemon sauce recipe, such a section might describe how to recognize when the sauce had thickened sufficiently, including a photograph to illustrate the text. Again, a cook could thicken the sauce without this information, but a beginner would find it useful.

Formative Reviews
In addition to informal feedback from colleagues and team members during development of your chapter, all EET chapters receive internal (EET Team) and external (teacher consultants) reviews before they go live. These reviews have been especially useful because they provide you with feedback from a perspective other than your own. After you’ve received, considered, and implemented feedback from these reviews, your chapter will go live, and be added to the Chapters in the EET page. At that time, the chapter will also be field tested in a classroom situation, resulting in further input to you on how to make it most effective.

A special note: Please! Don't share your password to the SERC CMS in order to give other folks a preview of what you're working on. The Password Protection column on your module page allows you to make a Dev page accessible to the world without having to log on through the SERC Admin site. If you turn off the password protection for pages in your module, you can send the Dev URLs to reviewers or other contributors, and they can see the output Dev pages without having to log on. This doesn’t give them access to the edit interface for your pages, only the output pages.
Building EET Chapters
EET chapters are created, updated, and displayed using a Content Management System (CMS). Our particular CMS is managed by Sean Fox of the Science Education Resource Center (SERC) at Carleton College in Northfield, Minnesota. You can find out all about Sean’s CMS by reading his informative and entertaining documentation at http://serc.carleton.edu/serc/cms/index.html.

All the tools for building EET Chapters are accessed through the main SERC admin page at http://serc.carleton.edu/admin. You'll need to be logged in to the Admin site (requires a password) to reach this Central Administration Page.

After you’ve entered your password and you’re at the Central Administration page, click the +expand link next to Earth Exploration Toolbook. This will display all the chapters to which you have access: two sample chapters, a Test chapter, and the chapter that's been set up specifically for you.

Beneath the name of each EET module or chapter, a link appears, preceded by the words "module-pages." This is the link that leads to the building/editing interface for each chapter. Follow this link for your chapter.
Here’s the module page for an Empty Module named DDS_09.

Each EET chapter has a single page like this. It is titled “Module Pages” and lists all the Web pages that are a part of the chapter. When you begin, you’ll see the words “Empty Module” in the Development Pages section. This indicates that the module doesn’t have any pages yet. You’ll learn all about the functionality of this page through developing your chapter.

First, you’ll need to create your pages so you can add content to them.
Creating pages for your chapter
To build your chapter, you need to create pages first, then edit them to add content. Creating a new page essentially involves selecting a page template, then setting up an appropriate URL for it.

Creating your chapter’s front page
1. On the main module page, in the Create a new page: section, select eet1_chapter_front from the “select a template” pop-up menu, then click the Create New Page button.
2. You’ll see your new Empty Page in the Development Pages list, with a default URL that ends in empty.html.
3. Click the Edit link following the URL to set up the page’s metadata.

The Edit link takes you to the Edit Page for your chapter’s top page.

To set your page’s title and URL, go to the Page Metadata section at the bottom and
1. change the Page Title from Empty Page to the name you’ve chosen for your chapter title
2. replace the word empty in the URL with the word index
3. click the Submit These Changes to the Page Metadata button.
The “Page Updated” message that appears at the very top of the page lets you know your changes were submitted. At the top of the edit page, click the link to go back to your Module Page—the one named after your chapter. You’ll see that the former “Empty Page” has been renamed and has a new URL. Note: If you use your browser’s Back button to return to this page, you’ll need to Refresh to see the change.

### Creating the rest of your chapter pages
Use information in the chart below to create the remainder of your chapter pages. Select the template and set the Page Metadata as indicated for each page of your chapter. To avoid confusion, click the Edit link and set the metadata immediately after you create each page.

Note: most chapters have 3 to 5 Parts, and 6 is the maximum number recommended. Only create as many Parts pages as your chapter will need.

<table>
<thead>
<tr>
<th>Page Title</th>
<th>Template Name</th>
<th>URL suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field of Page Metadata</strong></td>
<td><strong>Select from pop-up before clicking “Create New Page”</strong></td>
<td><strong>Replace “empty.html” in the Page Metadata field with the following</strong></td>
</tr>
<tr>
<td>“Your Chapter Title”</td>
<td>eet1_chapter_front</td>
<td>index.html</td>
</tr>
<tr>
<td>Teaching Notes</td>
<td>eet2_teaching_notes</td>
<td>teaching_notes.html</td>
</tr>
<tr>
<td>Case Study</td>
<td>eet3_case_study</td>
<td>case_study.html</td>
</tr>
<tr>
<td>Step-by-Step Instructions</td>
<td>eet4_all_parts</td>
<td>all_parts.html</td>
</tr>
<tr>
<td>Part 1</td>
<td>eet5_part</td>
<td>part_1.html</td>
</tr>
<tr>
<td>Part 2</td>
<td></td>
<td>part_2.html</td>
</tr>
<tr>
<td>Part 3</td>
<td></td>
<td>part_3.html</td>
</tr>
<tr>
<td>Part 4</td>
<td></td>
<td>part_4.html</td>
</tr>
<tr>
<td>Part 5</td>
<td></td>
<td>part_5.html</td>
</tr>
<tr>
<td>Part 6</td>
<td></td>
<td>part_6.html</td>
</tr>
<tr>
<td>Tools and Data</td>
<td>eet6_tool_data</td>
<td>tool_data.html</td>
</tr>
<tr>
<td>Going Further</td>
<td>eet7_going_further</td>
<td>going_further.html</td>
</tr>
</tbody>
</table>

Once you’ve created all your pages, the list of Development Pages on your module page should contain 9 to 12 distinctly named pages.
Building your Left Navigation Menu

Once your pages exist, you need to build the left navigation menu that will allow users to move easily between them. To build the menu, click the link at the bottom of your module page, under Edit the local development navigation menu.

Under Add New Link to this Menu, select the “Your Chapter Title” page from the pop-up menu. This is the first page, so it should go at the top of the menu. It is not a sub-menu of any other page. Select these options from the pop-up menus, then click the Add this link to the menu button.

Continue adding all the pages in the sequence indicated by the chart on the previous page. The Parts pages (1 through last) should all be entered as sub-menus of the Step-by-Step Instructions page.

If you need to reorder the menu, click the link in the last column to delete the entries of misplaced pages then add them to the menu again in the location you want them. Don’t worry—deleting items from the menu page only removes them from the menu. It doesn’t effect the page itself.

Here’s an example of a completed menu on the Menu Building page.

Menu: EET Test

This menu provides local navigation in EET_Chapter_2_test—development version

<table>
<thead>
<tr>
<th>Link Name</th>
<th>Link URL</th>
<th>Sub-menu of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your Chapter Title</td>
<td>/dev/eet/test/index.html</td>
<td>delete this entry</td>
</tr>
<tr>
<td>Teaching Notes</td>
<td>/dev/eet/test/teaching_notes.html</td>
<td>delete this entry</td>
</tr>
<tr>
<td>Case Study</td>
<td>/dev/eet/test/case_study.html</td>
<td>delete this entry</td>
</tr>
<tr>
<td>Step-by-Step Instructions</td>
<td>/dev/eet/test/all_parts.html</td>
<td>delete this entry</td>
</tr>
<tr>
<td>-Part 1</td>
<td>/dev/eet/test/part_1.html</td>
<td>Step-by-Step Instructions</td>
</tr>
<tr>
<td>-Part 2</td>
<td>/dev/eet/test/part_2.html</td>
<td>Step-by-Step Instructions</td>
</tr>
<tr>
<td>-Part 3</td>
<td>/dev/eet/test/part_3.html</td>
<td>Step-by-Step Instructions</td>
</tr>
<tr>
<td>About the Tool and Data</td>
<td>/dev/eet/test/tool_data.html</td>
<td>delete this entry</td>
</tr>
<tr>
<td>Going Further</td>
<td>/dev/eet/test/going_further.html</td>
<td>delete this entry</td>
</tr>
</tbody>
</table>
Editing (inserting content into) pages

To add content information to any page, click the Edit link immediately to the right of the page’s URL on your Module page. This will take you to the Edit Page where you can access the individual editing interfaces for each of the page’s content elements.

Begin by going to the Edit Page for your chapter’s top page (URL ends with index.html). Under Page Content Elements, click the top text link that reads EET Chapter Description. The link takes you to an Edit Text page. You’ll enter your Chapter Description text into the text field on the page (the word ‘empty’ appears in the text box by default), then add appropriate tags to format it.

A detailed explanation of what to include in the field appears directly above every element’s text box. Please follow the guidelines closely, to maintain consistency across EET chapters contributed by different authors.

Enter your chapter description text in the text box, and add appropriate tags to format it. Tags are snippets of text [surrounded by brackets] that tell browser software how to display the text they appear around. If you’ve worked with html before, many of these will be familiar. Even if you haven’t, it’s very easy to pick up using existing pages as models for your work.

- For a list of tags and descriptions of their functionality, access the CMS documentation pages (http://serc.carleton.edu/serc/cms/tags1.html and http://serc.carleton.edu/serc/cms/tags2.html)
- For a handy list of some basic tags and examples of their output formatting, check out http://serc.carleton.edu/admin/dynamic_pages/help.php
- For practical examples or models of tag use that you can copy and paste into your own chapter, access the edit interface for existing EET pages that have the formatting you desire

Once you’ve entered your text and tags into the text box, click the Make these Changes button.

NOTE: We strongly recommend using the modeling approach rather than reinventing formatting that already exists on similar pages in other chapters. Feel free to peruse the pages of completed EET chapters to find examples of formatting that would work for your chapter. When you find what you like, go to the editing interface for that particular page and copy the text and tags, then paste them right into your own chapter and modify them.

To see how what you’ve entered in the editing interface will look on its EET output page, click the View this Development Page in a new window link near the top of the page. This link gives you a way to get immediate feedback on your tags and text. If the output isn’t just what you were expecting, go back to the edit interface, modify your input, and click the Make These Changes button again. Note that you’ll need to refresh the Development Page window to see the changes.
Preparing, Uploading, and Displaying Images
Screen shots of dialog boxes that users will encounter when performing the steps of your chapter help users stay on track. Whenever you think someone might need a visual check to see if they’re doing the right thing, include an image so they can assess their progress.

To date, the preparation of images has been the most difficult thing to standardize for EET chapters. Choosing the appropriate area of a dialog box to provide a broad context as well as the level of specificity demanded by the instructions can be difficult. Peruse existing chapters for examples of clearly displayed dialog boxes to get an idea of what works well. Generally, include images that show ONLY the details that pertain to the step you’re on—it’s fine to crop parts of a dialog box that aren’t important for the user to see.

As the images in this document illustrate, the EET standard is to annotate screen shots of dialog boxes using red ovals. You can add text to the screen shot itself (see page 9) or simply add red symbols to draw attention to a specific portion of the image, and discuss what needs to happen at that location in the regular instruction text.

Chapter authors have used a variety of methods and software applications to prepare images. Generally, they use screen capture capabilities (either the computer’s built-in method or some third party software) to obtain the image they want, then use a vector-based image program (a free Paint-type program or a commercial application like Photoshop or Fireworks) to crop the image, add annotations, and export the result in an appropriate format. If you’ve done any image editing before at all, you can probably use the application that you’re familiar with to prepare images for an EET chapter.

Image Formats
All images must be in .gif and .jpg format. Images that show solid areas of single colors should be saved as .gif files and photographic-type images composed of pixels that span a large range of colors should be saved as .jpg files.

Image Size
All images should be as small as is reasonable while clearly showing what you want users to see. A practical maximum image size is 500 pixels wide. To present the clearest images possible, resize them to their intended display size before uploading them. The CMS does allow you to display images at sizes smaller than you’ve uploaded them, but they may not retain the same level of clarity as the original.
Getting Images into the CMS
In order to display an image on an EET page, you need to upload it into your module in the CMS first, then use a text command at the appropriate place in your text box to display the image on your output page.

On the editing interface page (Edit Text) for any page content element in your chapter, click the Add/View images for this module link that appears below the text box. This brings you to the Manage Image page where you’ll upload images that you’ve prepared for the chapter.

The “Upload an Image” process is very straightforward:
- enter the image’s name (no extension, please)
- give a text description of the image
- select the image type (must be .gif or .jpg)
- then click Browse… and navigate to the location where the image file is stored on your computer.

Click “Upload Image” and a thumbnail of the image and a unique image number (in square brackets, preceded by the word image) assigned by the CMS will appear in the table at the top.

Displaying Images on your Pages
Insert the bracketed text that shows the image’s unique number into the text field where you want the image to appear, and click the Make These Changes button. To view the output page, click the View this Development Page in a new window link.

For more control over the size and location of the image on the output page, use the syntax indicated at http://serc.carleton.edu/serc/cms/tags2.html. Again, examining tags in the text boxes of existing chapters is a good way to discover the formatting and tags that will display images the way you want to.
Development versus Live pages
You will only need to understand the difference between Development (Dev) and Live pages once your chapter is ready to show to the world. You may want to skip reading this section until that point…

Every EET chapter exists in two completely separate versions. There is a 'live' version that is viewable to the public and there is a development or 'dev' version which is password protected. All of your editing/creating/developing work should be done on the development version of the chapter. The "Replace the existing live pages with the development pages" link that appears on the main module editing page does exactly what it says, replicating the current development pages as live pages that are accessible by the entire Web-using public. Whenever this link is activated, the current Dev pages replace whatever 'live' pages might have existed.

Please work strictly with the dev versions of the pages until your chapter is ready to go public. At that point we'll continue to make any changes and updates to the dev pages and only replicate the dev version over the top of the live version when we're confident the updates are what we want. By default it's the 'dev' version of the pages that are listed on the main edit menu for the chapter.

If needed, it's possible to access and edit live pages directly (e.g. to correct a typo quickly without disturbing a major rewrite that is in progress in the dev version of the pages). The 'dev' version of any page can be accessed by adding 'dev' to the URL for the page in question (immediately after the .edu). For example, http://serc.carleton.edu/eet/index.html is a 'live' page, http://serc.carleton.edu/dev/eet/index.html is the 'dev' page.