

RStudio

Working with R – RStudio

RStudio is an Integrated Development Environment (IDE) for R and it helps you:

- write code - makes suggestions
- view the output of your code, including plots
- find errors
- manage files
- view documentation

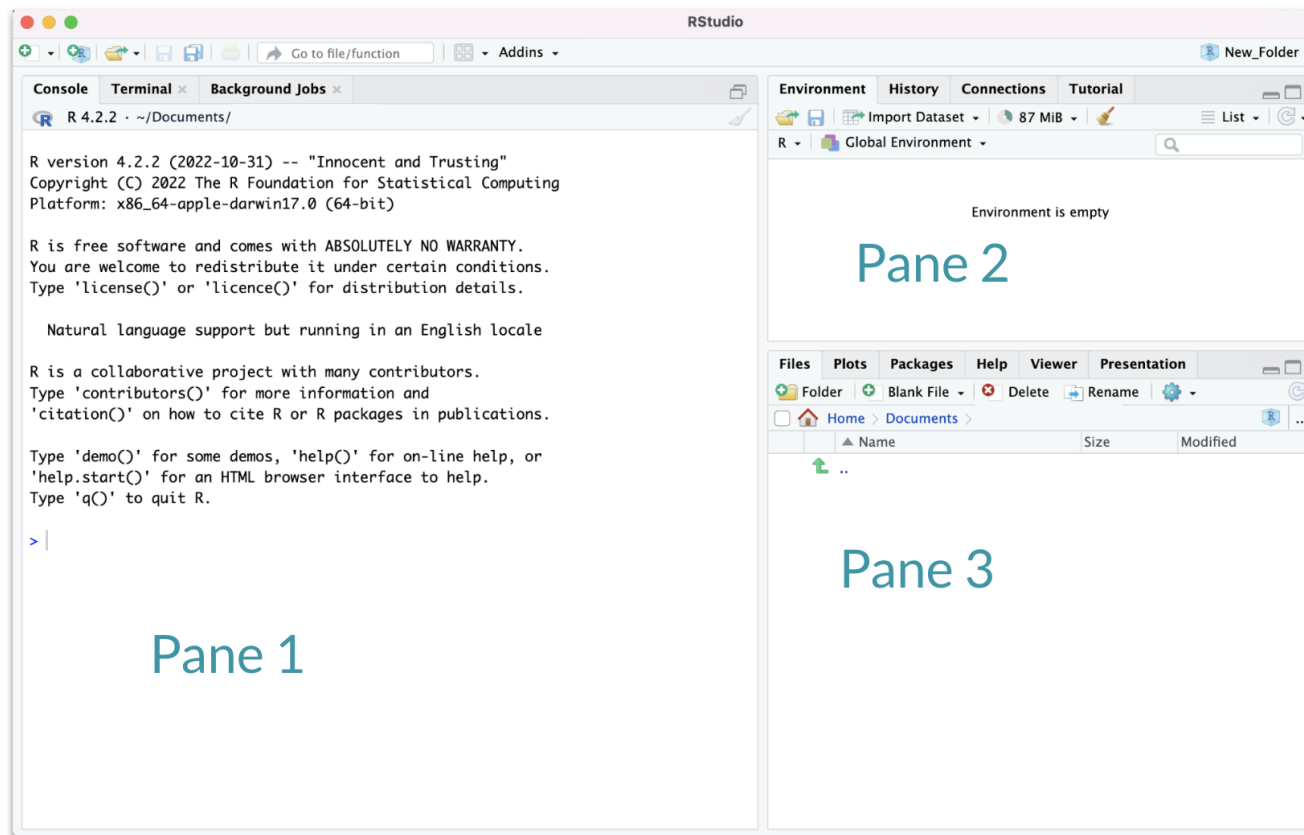


[\[source\]](#)

RStudio used to be the name of a company that is now called [Posit](#).

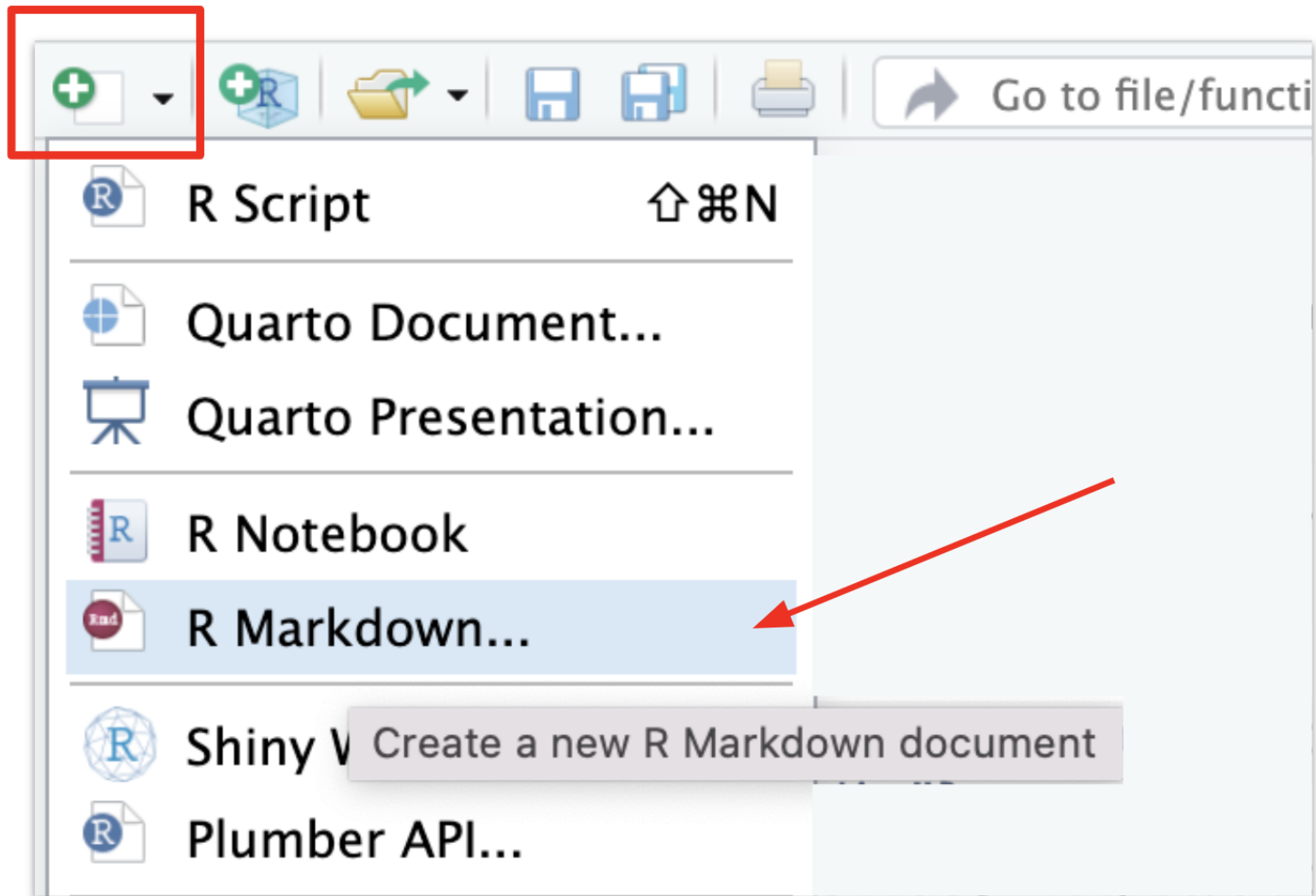
RStudio

First it is important to be familiar with the layout. When you first open RStudio, you will see 3 panes.



Hidden Pane

To save a copy of your code. You must open a file first - this will open a 4th pane. These files include Scripts or what are called R Markdown files.

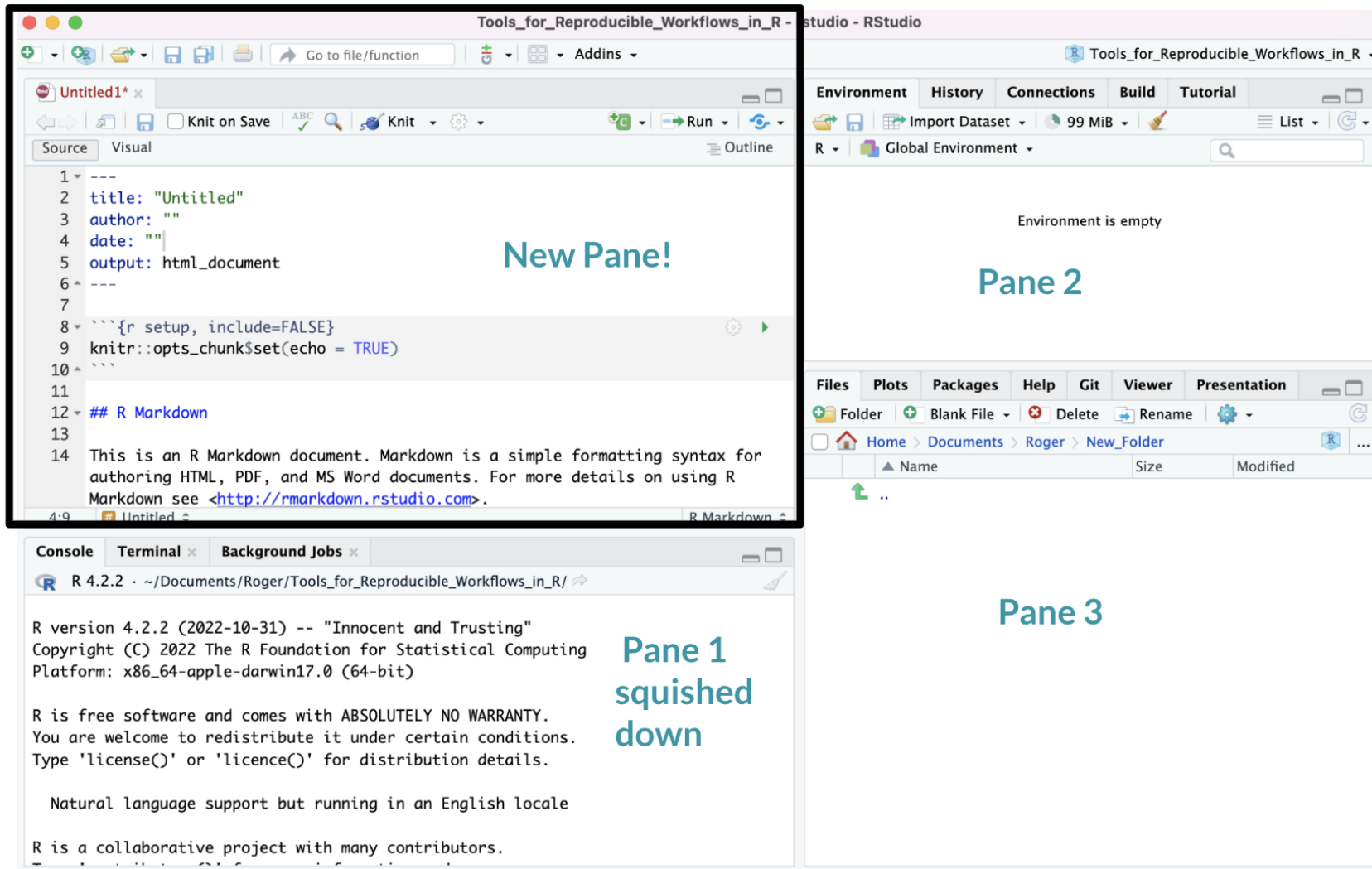


Hidden Pane

You will see a popup that you can just say "OK" to for now.

Hidden Pane

Nice! now we have a place to save code! This is where we will mostly be working.



Working with R in R Studio - 2 major panes:

1. The **Source/Editor**:

- Top by default
- **saves your code**

2. The **R Console**:

- Bottom by default
- Calculator
- Place to try things out, then add to your editor
- **doesn't save your code**

RStudio

Super useful “cheatsheet”: [LINK](#)

Write Code

- Navigate tabs
- Open in new window
- Save
- Find and replace
- Compile as notebook
- Run selected code
- Re-run previous code
- Source with or without Echo
- Show file outline
- Multiple cursors/column selection with **Alt + mouse drag**.
- Code diagnostics that appear in the margin. Hover over diagnostic symbols for details.
- Syntax highlighting based on your file's extension
- Tab completion to finish function names, file paths, arguments, and more.
- Multi-language code snippets to quickly use common blocks of code.
- Jump to function in file
- Change file type

R Support

- Import data with wizard
- History of past commands to run/copy
- Display .RPres slideshows **File > New File > R Presentation**
- Load workspace
- Save workspace
- Delete all saved objects
- Search inside environment
- Choose environment to display from list of parent environments
- Display objects as list or grid
- Displays saved objects by type with short description
- View in data viewer
- View function source code
- Create folder
- Upload file
- Delete file
- Rename file
- Change directory
- Path to displayed directory
- A File browser keyed to your working directory. Click on file or directory name to open.

Console

```
> foo(1)
[1] 2
> foo <- function(x) x + 1
> foo(2)
foo(2)
foo(2)
foo(1)
```

Environment

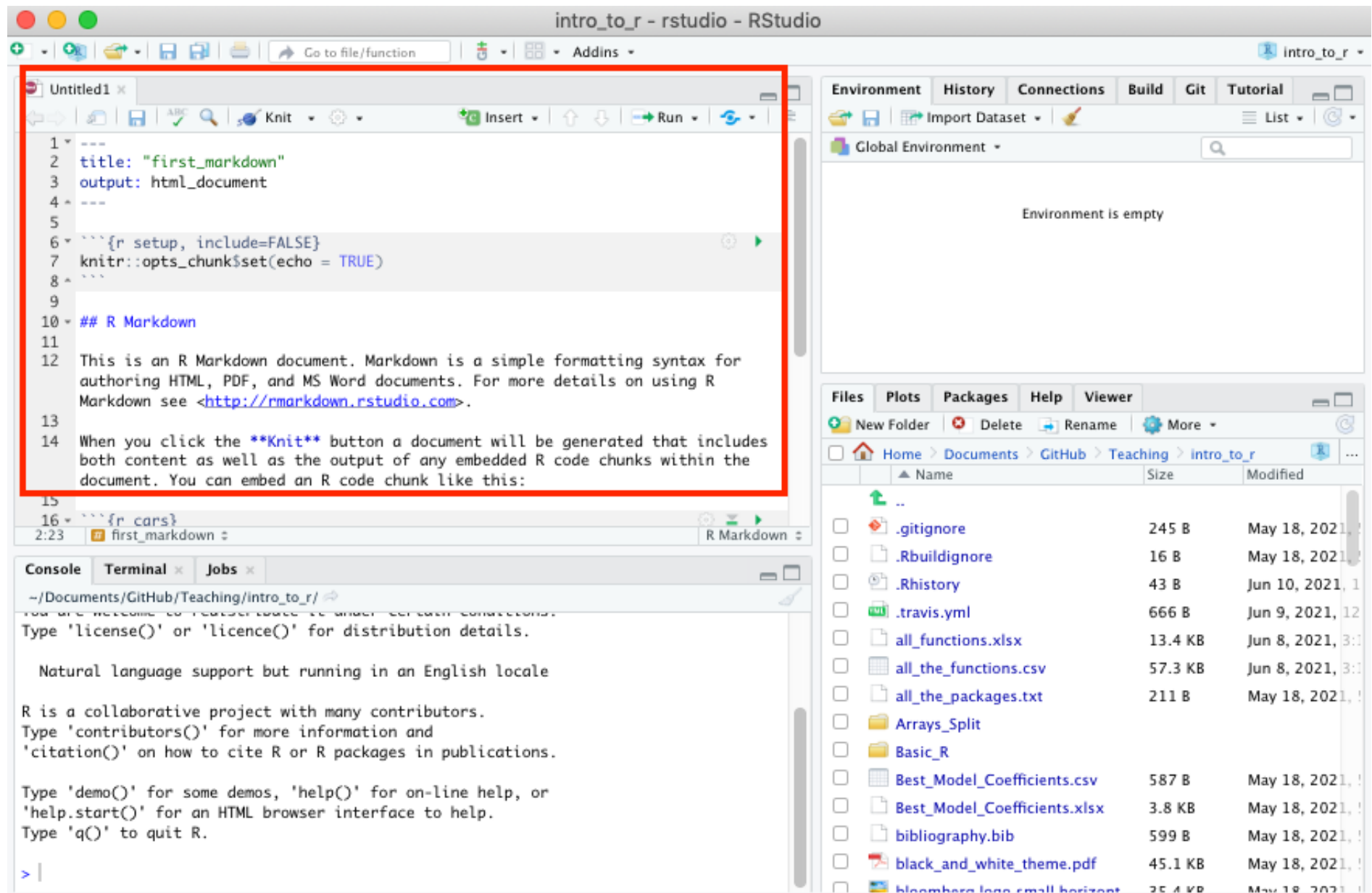
Object	Value
iris	150 obs. of 5 variables
a	1
foo	function (x)

Files

Name	Size	Modified
..		
hello.R	19 B	Apr 13, 2016, 11:17 AM

R Markdown files look different from scripts

It will look like this with text in it.



The screenshot shows the RStudio interface with the following content:

```
1 ---
2 title: "first_markdown"
3 output: html_document
4 ---
5
6 ```{r setup, include=FALSE}
7 knitr::opts_chunk$set(echo = TRUE)
8 ```
9
10 ## R Markdown
11
12 This is an R Markdown document. Markdown is a simple formatting syntax for
13 authoring HTML, PDF, and MS Word documents. For more details on using R
14 Markdown see <http://rmarkdown.rstudio.com>.
15
16 When you click the Knit button a document will be generated that includes
17 both content as well as the output of any embedded R code chunks within the
18 document. You can embed an R code chunk like this:
19
20 ```{r cars}
21 
```

The console shows the R startup message:

```
~/Documents/GitHub/Teaching/intro_to_r/
You are welcome to redistribute this under certain conditions.
Type 'license()' or 'licence()' for distribution details.

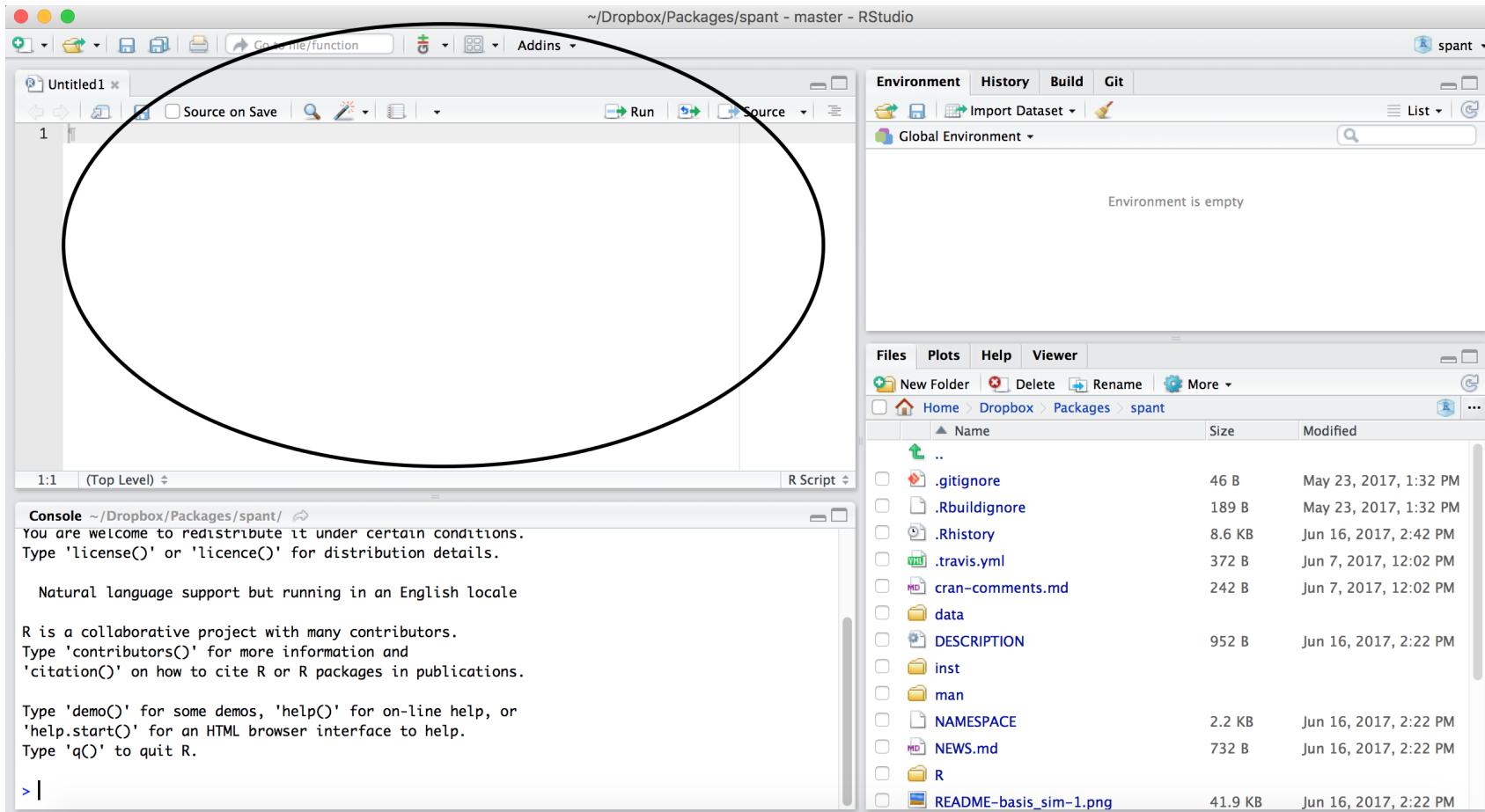
Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

Scripts will just be empty



The screenshot shows the RStudio interface for a project named 'spant'. The main editor window, titled 'Untitled1', is empty and circled in black. The environment pane on the right shows 'Global Environment' with the message 'Environment is empty'. The console at the bottom displays the R startup message, including instructions on how to use the help system and quit R.

```
~/Dropbox/Packages/spant - master - RStudio  
Addins  
Source on Save  
Run  
Source  
1  
1:1 (Top Level) R Script  
Console ~/Dropbox/Packages/spant/  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.  
  
Natural language support but running in an English locale  
  
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
> |
```

Name	Size	Modified
..		
.gitignore	46 B	May 23, 2017, 1:32 PM
.Rbuildignore	189 B	May 23, 2017, 1:32 PM
.Rhistory	8.6 KB	Jun 16, 2017, 2:42 PM
.travis.yml	372 B	Jun 7, 2017, 12:02 PM
cran-comments.md	242 B	Jun 7, 2017, 12:02 PM
data		
DESCRIPTION	952 B	Jun 16, 2017, 2:22 PM
inst		
man		
NAMESPACE	2.2 KB	Jun 16, 2017, 2:22 PM
NEWS.md	732 B	Jun 16, 2017, 2:22 PM
R		
README-basis_sim-1.png	41.9 KB	Jun 16, 2017, 2:22 PM

Scripts and R Markdown

Although people will use scripts often, and they are good for more programmatic purposes, we generally don't recommend them for Public Health Researchers.

For data analyses, R Markdown files are generally superior because they allow you to check your code and write more info about your code.

Workspace/Environment

The screenshot displays the RStudio interface with the following components:

- Environment Pane:** Located at the top right, it shows "Global Environment" and "Environment is empty". This pane is circled in black.
- Files Pane:** Located at the bottom right, it shows a file explorer view of the project directory. The files listed are:

Name	Size	Modified
..		
.gitignore	46 B	May 23, 2017, 1:32 PM
.Rbuildignore	189 B	May 23, 2017, 1:32 PM
.Rhistory	8.6 KB	Jun 16, 2017, 2:42 PM
.travis.yml	372 B	Jun 7, 2017, 12:02 PM
cran-comments.md	242 B	Jun 7, 2017, 12:02 PM
data		
DESCRIPTION	952 B	Jun 16, 2017, 2:22 PM
inst		
man		
NAMESPACE	2.2 KB	Jun 16, 2017, 2:22 PM
NEWS.md	732 B	Jun 16, 2017, 2:22 PM
R		
README-basis_sim-1.png	41.9 KB	Jun 16, 2017, 2:22 PM
- Console:** Located at the bottom left, it shows the R startup message:

```
~/Dropbox/Packages/spant/
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.

Natural language support but running in an English locale

R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

> |
```

Workspace/Environment

- Tells you what **objects** are in R
- What exists in memory/what is loaded?/what did I read in?

History

- Shows previous commands. Good to look at for debugging, but **don't rely** on it.
Instead use RMarkdown!
- Also type the “up” key in the Console to scroll through previous commands

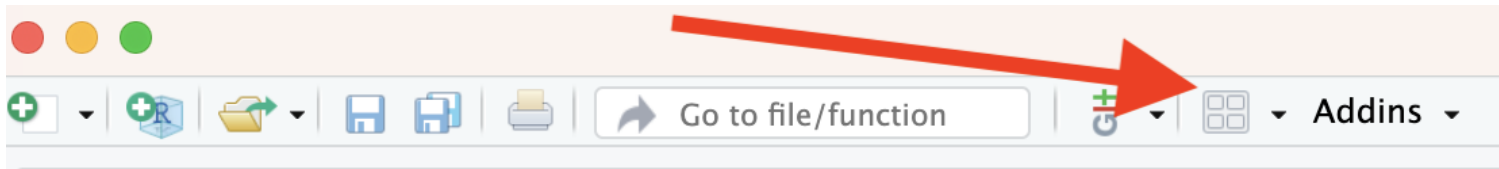
Lower Right Pane

- **Files** - shows the files on your computer of the directory you are working in
- **Viewer** - can view data or R objects
- **Help** - shows help of R commands
- **Plots** - pictures and figures
- **Packages** - list of R packages that are loaded in memory

RStudio Layout

If RStudio doesn't look the way you want (or like our RStudio), then:



Click on the pane button, which looks like a waffle with 4 indentations. Scroll down to "Pane Layout".



Default Layout

Options

Choose the layout of the panels in RStudio by selecting from the controls in each panel. Add up to three additional Source Columns to the left side of the layout. When a column is removed, all saved files within the column are closed and any unsaved files are moved to the main Source Pane.

 Add Column |  Remove Column

Panel	Content
Source	<input checked="" type="checkbox"/> Environment <input checked="" type="checkbox"/> History <input type="checkbox"/> Files <input type="checkbox"/> Plots <input checked="" type="checkbox"/> Connections <input type="checkbox"/> Packages <input type="checkbox"/> Help <input checked="" type="checkbox"/> Build <input type="checkbox"/> VCS
Console	<input type="checkbox"/> Environment <input type="checkbox"/> History <input checked="" type="checkbox"/> Files <input checked="" type="checkbox"/> Plots <input type="checkbox"/> Connections <input checked="" type="checkbox"/> Packages <input checked="" type="checkbox"/> Help <input type="checkbox"/> Build <input checked="" type="checkbox"/> VCS

OK Cancel Apply

**Let's take a look at R Studio
ourselves!**

R Markdown file

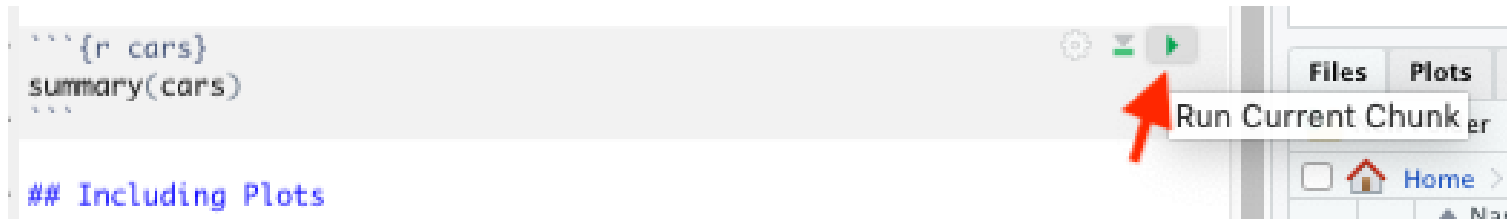
R Markdown files (.Rmd) help generate reports that include your code and output.

1. Helps you describe your code
2. Allows you to check the output
3. Can create many different file types

Code chunks

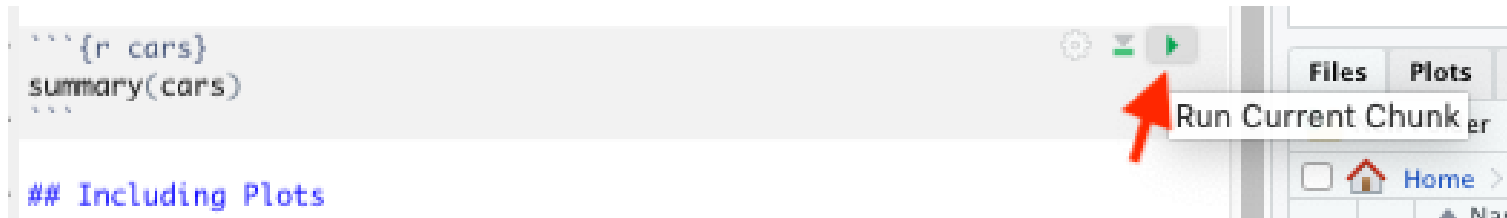
Within R Markdown files are code “chunks”.

This is where you can type R code and run it!



Run code in a chunk

Clicking the run (play) button runs the code in the chunk.



Ctrl + Enter on Windows or Command + Enter on Mac in your script evaluates that line of code

Running a chunk executes the code

- generally see a preview of the output of the code just below the chunk
- see the code in the console

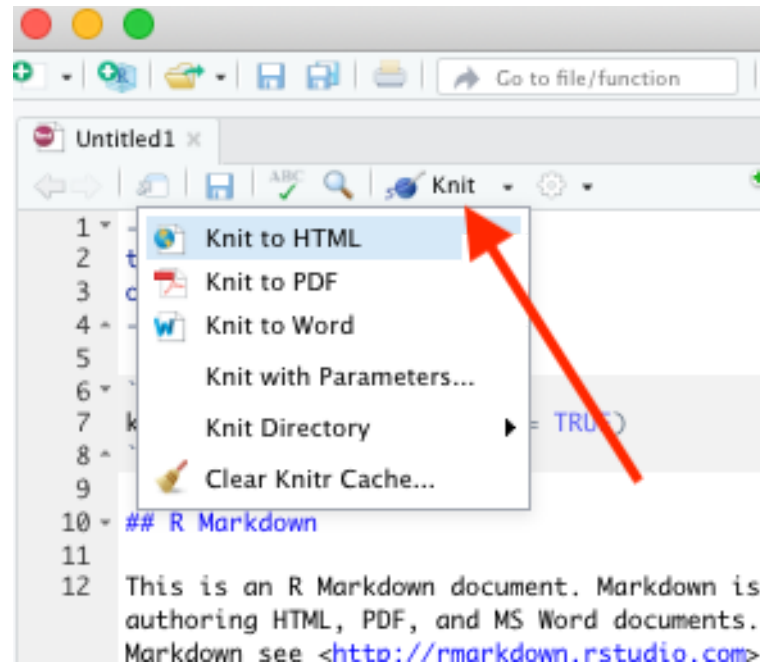
If you get annoyed by code previews in Markdown files...

See the [Help page](#) of the website. You can adjust this and change your RStudio settings:

Tools > Global Options > Appearance

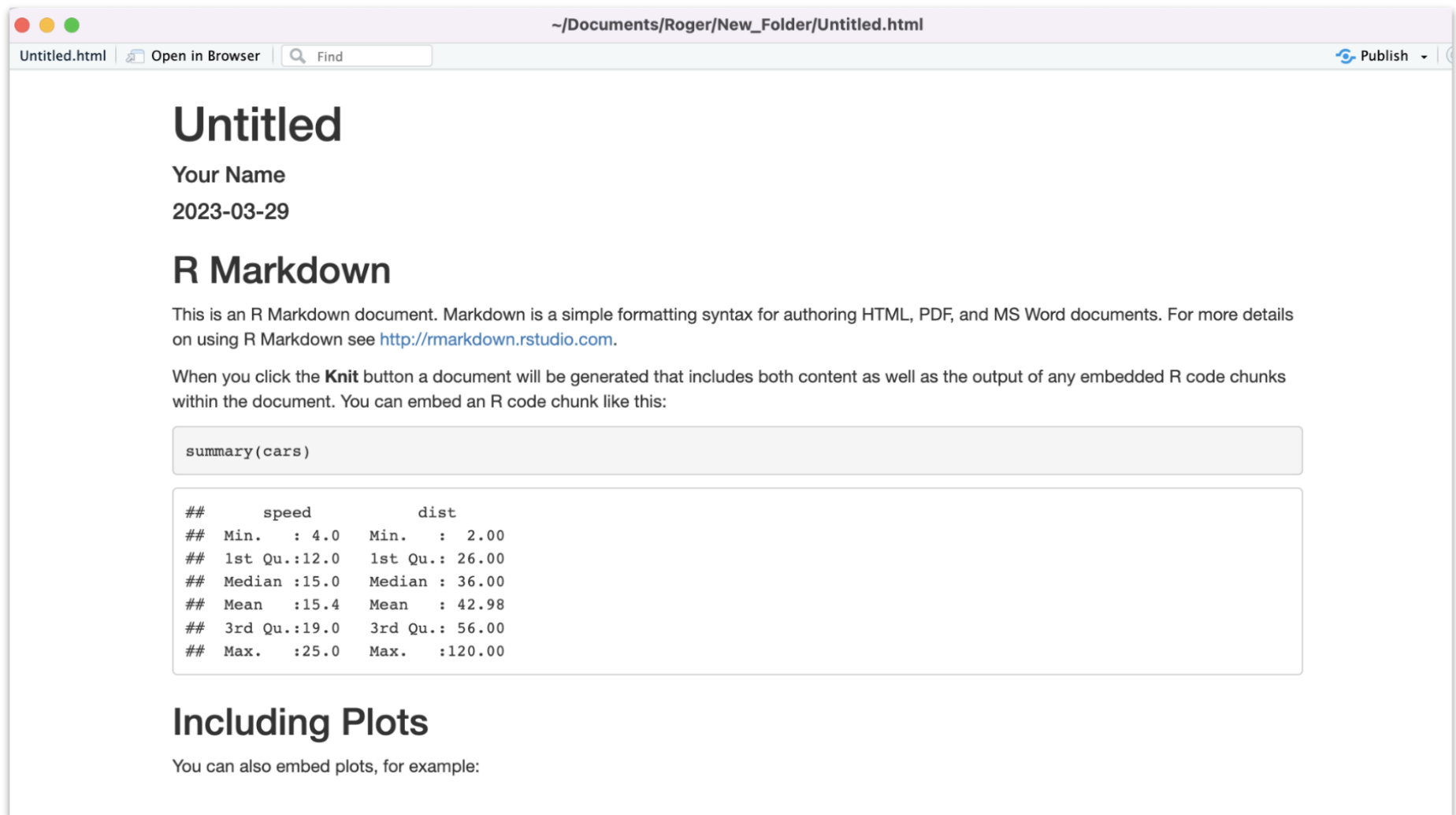
Knit file to html

Running all chunks - this will create a report from the R Markdown document!
Note that it can't use anything not included in the file, it can't use objects in your environment that you were modifying interactively.



Nice report!

This generates a nice report that you can share with others who can open in any browser.



The screenshot shows a web browser window with the address bar displaying `~/Documents/Roger/New_Folder/Untitled.html`. The browser tab is titled "Untitled.html" and includes "Open in Browser" and "Find" options. A "Publish" button is visible in the top right corner. The main content of the page is as follows:

Untitled

Your Name
2023-03-29

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed      dist
## Min.   : 4.0   Min.    : 2.00
## 1st Qu.:12.0   1st Qu.: 26.00
## Median :15.0   Median : 36.00
## Mean   :15.4   Mean    : 42.98
## 3rd Qu.:19.0   3rd Qu.: 56.00
## Max.   :25.0   Max.    :120.00
```

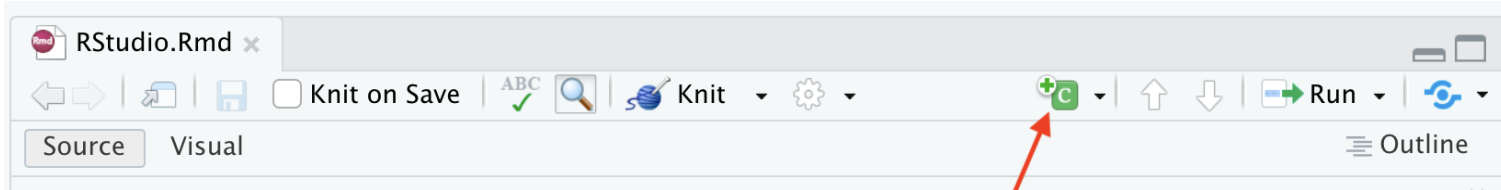
Including Plots

You can also embed plots, for example:

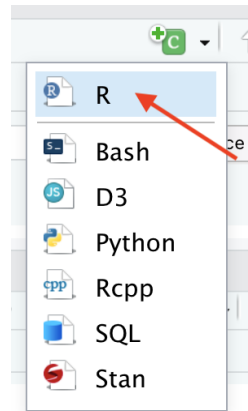
Create Chunks

To create a new R code chunk:

- Use the insert code chunk button at the top of RStudio.



- Select R (default) as the language:



Create Chunks

If you like keyboard shortcuts:

- Windows & Linux use Ctrl+Alt+I
- Mac use Command+Option+I

I is for insert.

Run previous chunks button

You can run all chunks above a specific chunk using this button:

```
``{r, out.width = "80%", echo = FALSE, fig.align='center'}  
knitr::include_graphics("images/chunk.png")  
``
```



Errors

R studio can help you find issues in your code. Note that sometimes the error occurs earlier than RStudio thinks.

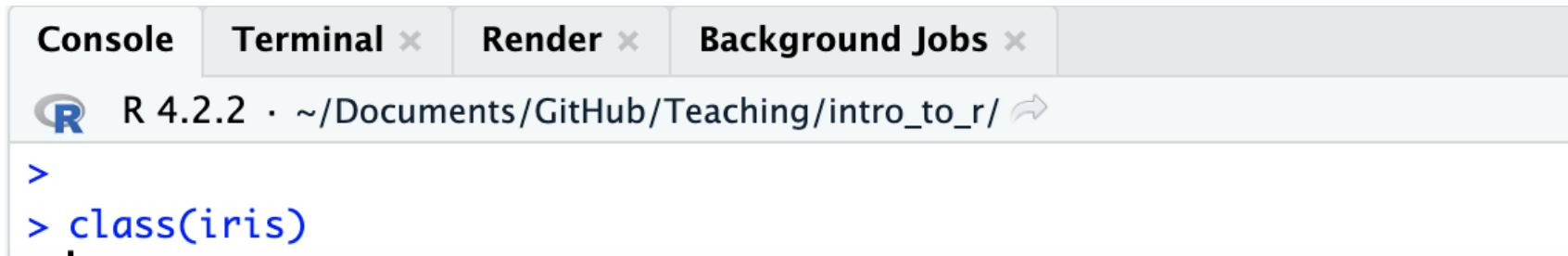


The screenshot shows a snippet of R code in a text editor. Line 305 contains `print(x, ...)` with a yellow highlight. Line 306 contains `{r}`. Line 307 contains `print(x))|` and is marked with a red 'x' icon. A tooltip box is open over the closing parenthesis on line 307, displaying the error message: `unexpected token ')'` and `unexpected end of document`. The editor interface includes a gear icon, a dropdown arrow, and a green play button on the right side.

```
305 print(x, ...)  
306 {r}  
307 print(x))|  
308 ``````  
3 unexpected token ')'  
3 unexpected end of document
```

Recap of where code goes

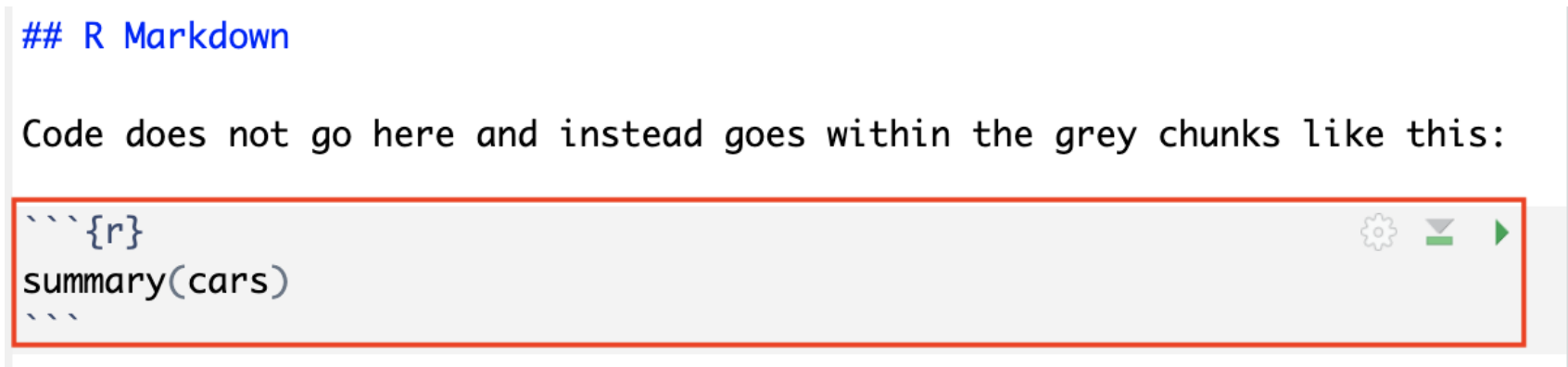
- you can test code in the console



The screenshot shows an R console window with the following elements:

- Tabbed interface with tabs: Console, Terminal x, Render x, Background Jobs x.
- Header bar: R 4.2.2 · ~/Documents/GitHub/Teaching/intro_to_r/ ↗
- Input prompt: >
- Code being entered: > class(iris)

- you can save code in a chunk in the editor (Markdown file)



The screenshot shows an R Markdown editor with the following elements:

- Header: ## R Markdown
- Text: Code does not go here and instead goes within the grey chunks like this:
- Code chunk (highlighted with a red border):

```
```{r}
summary(cars)
```
```
- Chunk controls: gear icon, dropdown arrow, and play button.

Gut Check

Why are R Markdown files so useful?

1. They let you test your code
2. They let you view the output of your code
3. They let you generate cool reports
4. All of the above

Gut Check

Where does code go typically in an Rmd file?

A

```
```{r}
```

**B**


```
```
```

C

Gut Check

Which button do you click to run the code in a current chunk?

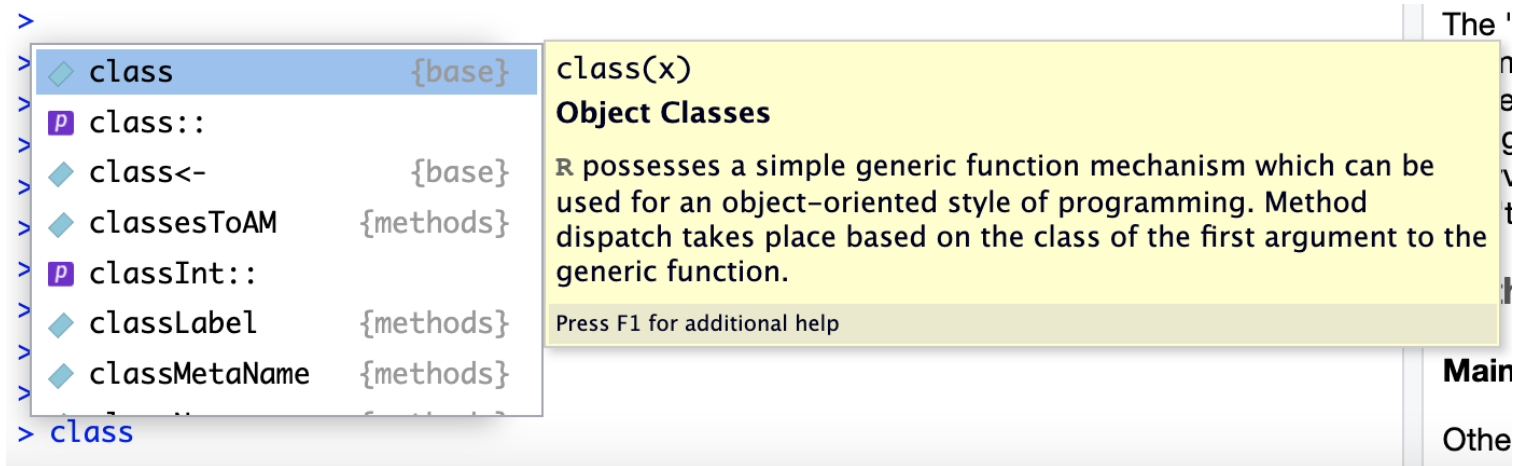
```
```${r}  
library(tidyverse)
```
```

The image shows the right side of an RStudio code chunk toolbar. It contains three icons: a gear icon for settings, a button with a downward-pointing triangle (labeled 'A'), and a button with a right-pointing triangle (labeled 'B'). Both buttons 'A' and 'B' are highlighted with red boxes.

A B

Getting help from the preview

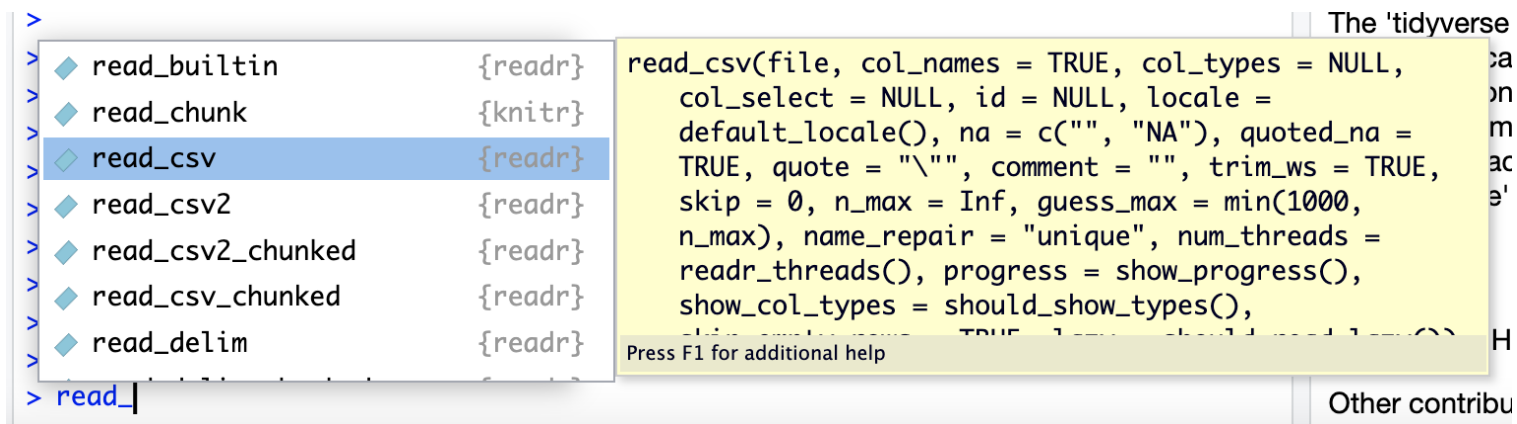
When you type in a function name, a pop up will preview documentation to help you. It also helps you remember the name of the function if you don't remember all of it!



The screenshot shows an R console with a list of functions. The 'class' function is selected, and a help preview window is open. The preview window displays the title 'class(x) Object Classes' and a description: 'R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.' Below the description is a prompt: 'Press F1 for additional help'.

| Function | Package |
|---------------|-----------|
| class | {base} |
| class:: | |
| class<- | {base} |
| classesToAM | {methods} |
| classInt:: | |
| classLabel | {methods} |
| classMetaName | {methods} |

class(x)
Object Classes
R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.
Press F1 for additional help



The screenshot shows an R console with a list of functions. The 'read_csv' function is selected, and a help preview window is open. The preview window displays the title 'read_csv(file, col_names = TRUE, col_types = NULL, col_select = NULL, id = NULL, locale = default_locale(), na = c("", "NA"), quoted_na = TRUE, quote = "\"", comment = "", trim_ws = TRUE, skip = 0, n_max = Inf, guess_max = min(1000, n_max), name_repair = "unique", num_threads = readr_threads(), progress = show_progress(), show_col_types = should_show_types(), skip_comments = TRUE, skip_empty_lines = TRUE)' and a prompt: 'Press F1 for additional help'.

| Function | Package |
|-------------------|---------|
| read_builtin | {readr} |
| read_chunk | {knitr} |
| read_csv | {readr} |
| read_csv2 | {readr} |
| read_csv2_chunked | {readr} |
| read_csv_chunked | {readr} |
| read_delim | {readr} |

read_csv(file, col_names = TRUE, col_types = NULL, col_select = NULL, id = NULL, locale = default_locale(), na = c("", "NA"), quoted_na = TRUE, quote = "\"", comment = "", trim_ws = TRUE, skip = 0, n_max = Inf, guess_max = min(1000, n_max), name_repair = "unique", num_threads = readr_threads(), progress = show_progress(), show_col_types = should_show_types(), skip_comments = TRUE, skip_empty_lines = TRUE)
Press F1 for additional help

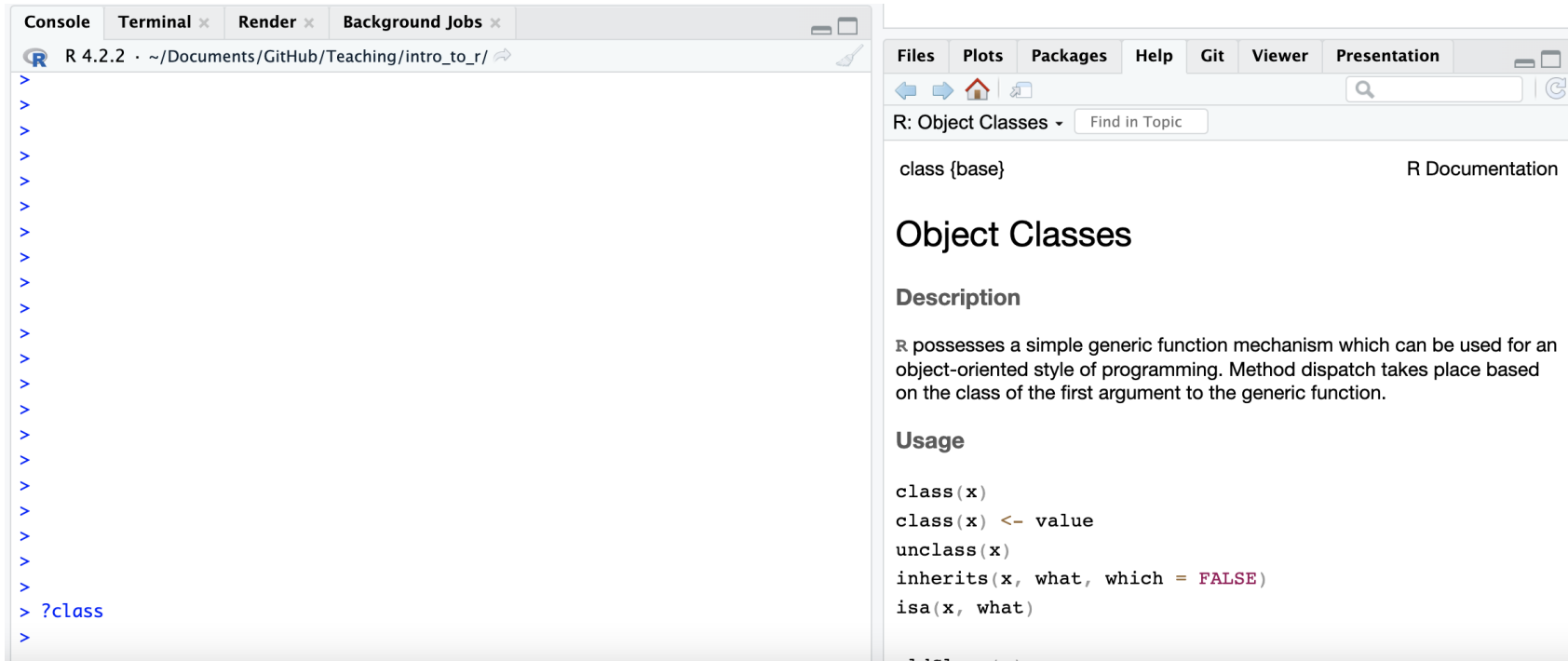
Get help with the help pane

Getting Help with ?

If you know the name of a package or function:

Type `?package_name` or `?function_name` in the console to get information about packages and functions.

For example: `?readr` or `?read_csv`.

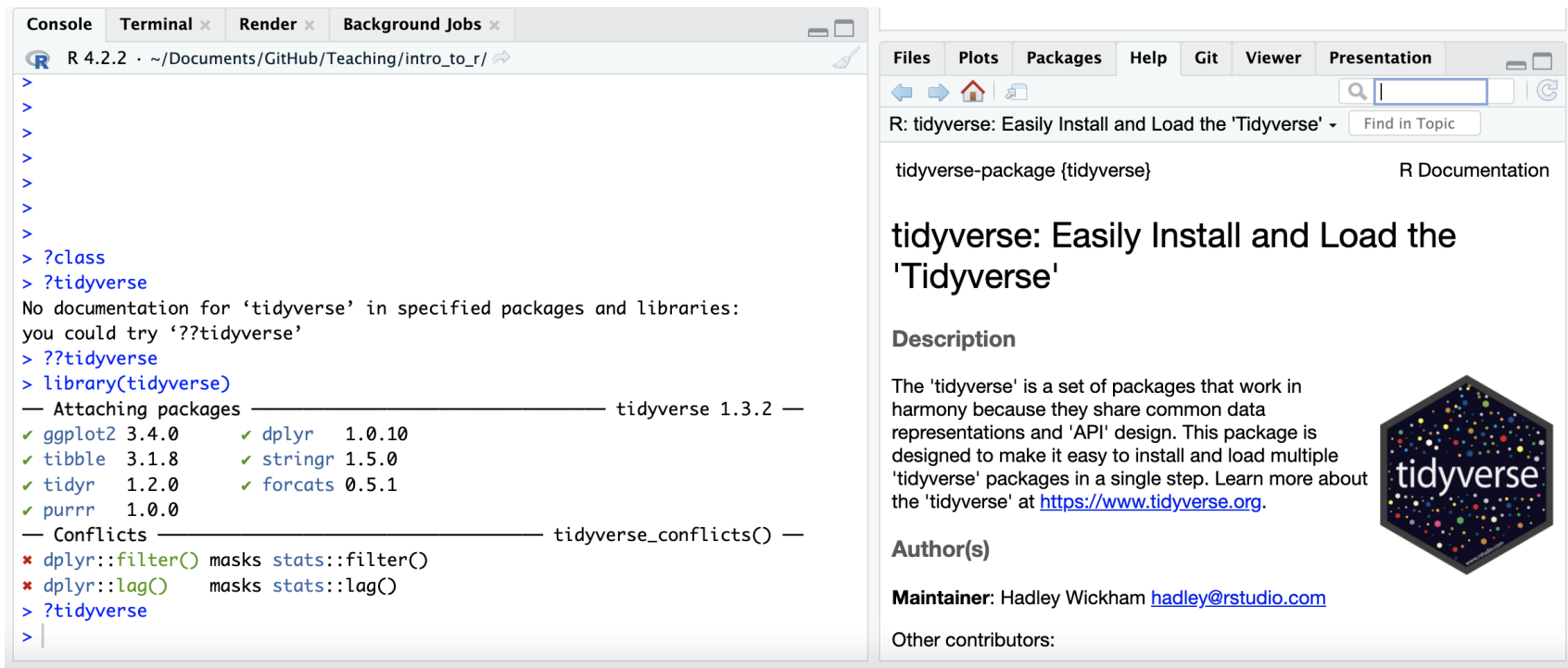


The screenshot shows the R Studio interface. On the left, the console window displays a series of prompt characters (>) and the command `?class` at the bottom. On the right, the help window is open to the 'Object Classes' topic. The help window has a menu bar with 'Files', 'Plots', 'Packages', 'Help', 'Git', 'Viewer', and 'Presentation'. Below the menu bar is a search bar with the text 'R: Object Classes' and a 'Find in Topic' button. The main content area of the help window is titled 'Object Classes' and includes a 'Description' section with the text: 'R possesses a simple generic function mechanism which can be used for an object-oriented style of programming. Method dispatch takes place based on the class of the first argument to the generic function.' Below the description is a 'Usage' section with the following code: `class(x)`, `class(x) <- value`, `unclass(x)`, `inherits(x, what, which = FALSE)`, and `isa(x, what)`.

Double Question Mark

If you haven't loaded a package yet into R than you may get a response that there is no documentation.

Typing in `??package_name` can show you packages that you haven't loaded yet.



The image shows two side-by-side windows from an R environment. The left window is the R console, and the right window is the R documentation viewer.

R Console Output:

```
>
>
>
>
>
>
>
> ?class
> ?tidyverse
No documentation for 'tidyverse' in specified packages and libraries:
you could try '??tidyverse'
> ??tidyverse
> library(tidyverse)
— Attaching packages — tidyverse 1.3.2 —
✔ ggplot2 3.4.0      ✔ dplyr  1.0.10
✔ tibble  3.1.8      ✔ stringr 1.5.0
✔ tidyr   1.2.0      ✔ forcats 0.5.1
✔ purrr   1.0.0
— Conflicts — tidyverse_conflicts() —
✖ dplyr::filter() masks stats::filter()
✖ dplyr::lag()    masks stats::lag()
> ?tidyverse
> |
```

R Documentation Viewer:


R: tidyverse: Easily Install and Load the 'Tidyverse' - Find in Topic

tidyverse-package {tidyverse} R Documentation

tidyverse: Easily Install and Load the 'Tidyverse'

Description

The 'tidyverse' is a set of packages that work in harmony because they share common data representations and 'API' design. This package is designed to make it easy to install and load multiple 'tidyverse' packages in a single step. Learn more about the 'tidyverse' at <https://www.tidyverse.org>.



Author(s)

Maintainer: Hadley Wickham hadley@rstudio.com

Other contributors:

Summary

- RStudio makes working in R easier
- the Editor (top) is for static code like scripts or R Markdown documents
- The console is for testing code (bottom) - best to save your code though!
- R markdown documents are really helpful for lots of reasons!
- R code goes within what is called a chunk (the gray box with a green play button)

□ [Class Website](#) □ [Lab](#) □ [Posit Cheatsheet](#) □ [Day 1 Cheatsheet](#)



Image by [Gerd Altmann](#) from [Pixabay](#)

Extra Slides

Chunk settings

Please [click here](#) to update the s

Chunk Name:

Output:

Show warnings

Show messages

Use paged tables

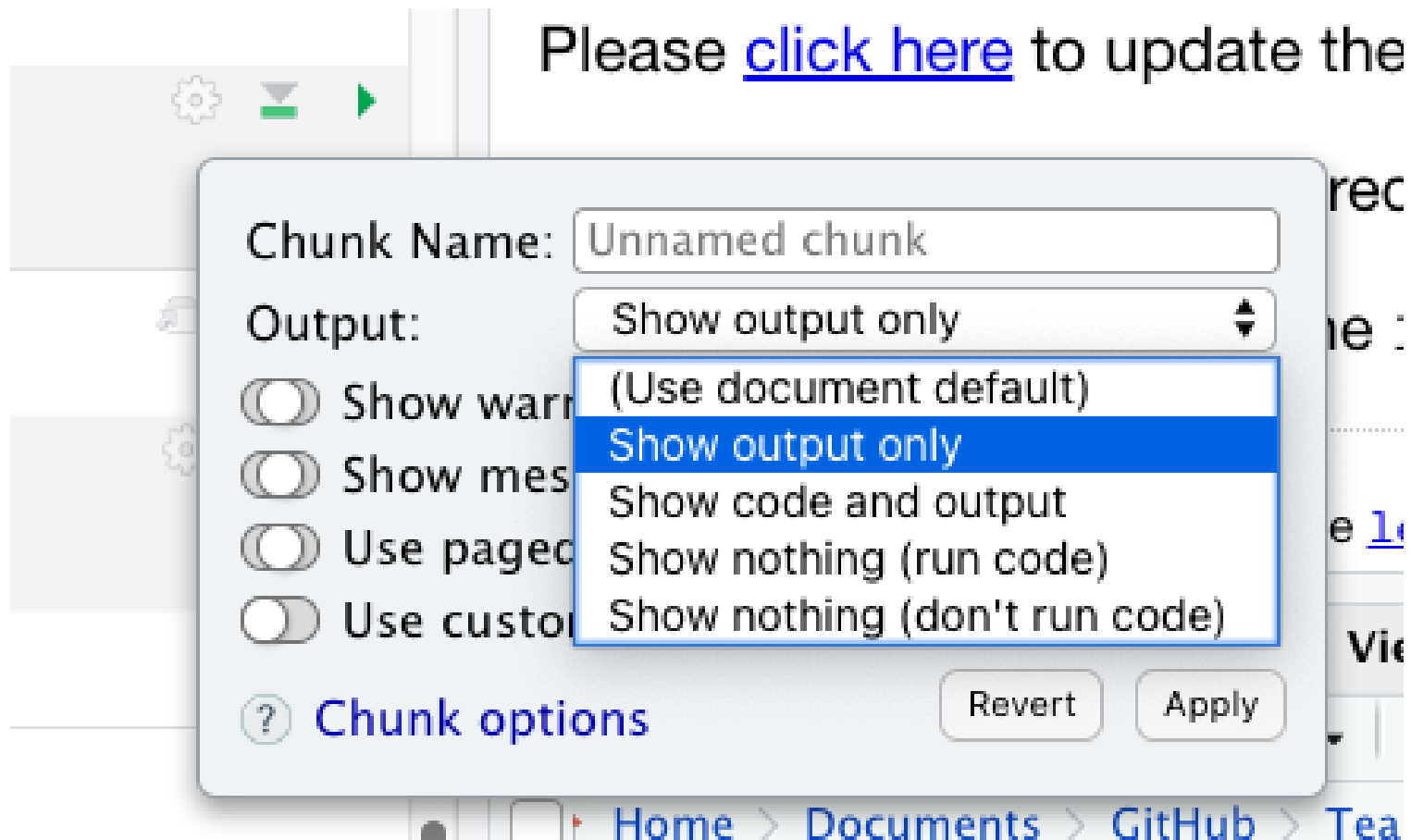
Use custom figure size

[? Chunk options](#)

Home > Documents > GitHub > Teach

Chunk settings

You can specify if a chunk will be seen in the report or not.



Rainbow Parentheses

Tools -> Global Options -> Code -> Display -> Use rainbow parentheses

This can help you see your code more easily.

Press enter to save this setting and get out of this menu.

```
(((((({{{{[[[[[ Enjoy your colorful code! ]]]]}}}})))))
```