

<https://intro2r.com/> Chapter 8

CSCI 297b, Spring 2023

April 30, 2023

Reproducible reports with R markdown

- Simple and easy plain text language.
 - **way** simpler and easier than HTML
- Includes formatting, headers, fonts, etc.
- Includes executable R code

Why use R markdown?

- Transparency in experimental methodology, observation, collection of data and analytical methods.
- Public availability and re-usability of scientific data
- Public accessibility and transparency of scientific communication
- Using web-based tools to facilitate scientific collaboration
- Links all your data and your code and your writing in a single document
- Wide variety of output formats from a single document:
pdf html web pages MS Word

Rmarkdown package

```
library(rmarkdown)
```

- You will need \LaTeX if you want to publish PDF
- Already installed on RStudio Workbench

Create, save, and knit new Rmarkdown document

```
---  
title: "demo"  
output:  
  word_document: default  
  html_document:  
    df_print: paged  
---  
  
'{r setup, include=FALSE}  
knitr::opts_chunk$set(echo = TRUE)  
'{
```

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents.

When you click the **Knit** button a document will be generated that includes both content as well as the results of running the R code in chunks.

```
'{r cars}  
summary(cars)  
'{
```

Including Plots

You can also embed plots, for example:

```
'{r pressure, echo=FALSE}  
plot(pressure)  
'{
```

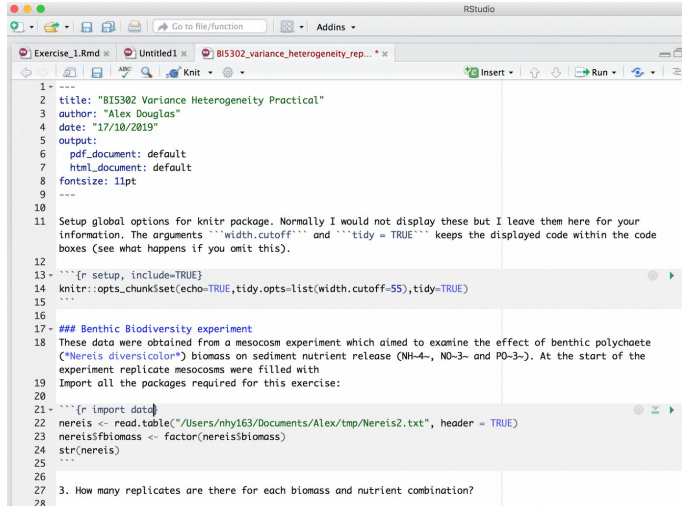
Note that the `'echo = FALSE'` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

Rmarkdown anatomy

YAML
header

formatted
text

code
chunk



```
1 ---
2 title: "BI5302 Variance Heterogeneity Practical"
3 author: "Alex Douglas"
4 date: "17/10/2019"
5 output:
6   pdf_document: default
7   html_document: default
8   fontsize: 11pt
9 ---
10
11 Setup global options for knitr package. Normally I would not display these but I leave them here for your
12 information. The arguments ``width.cutoff`` and ``tidy = TRUE`` keeps the displayed code within the code
13 boxes (see what happens if you omit this).
14
15 ```{r setup, include=TRUE}
16 knitr::opts_chunk$set(echo=TRUE, tidy.opts=list(width.cutoff=55), tidy=TRUE)
17 ```
18
19 ## Benthic Biodiversity experiment
20 These data were obtained from a mesocosm experiment which aimed to examine the effect of benthic polychaete
21 (*Nereis diversicolor*) biomass on sediment nutrient release (NH4-, NO3- and PO4-). At the start of the
22 experiment replicate mesocosms were filled with
23 Import all the packages required for this exercise:
24
25 ```{r import data}
26 nereis <- read.table("/Users/nhy163/Documents/Alex/tmp/Nereis2.txt", header = TRUE)
27 nereis$fbiomass <- factor(nereis$biomass)
28 str(nereis)
29 ```
30
31 3. How many replicates are there for each biomass and nutrient combination?
```

YAML header

```
---  
title: My first R markdown document  
author: Jane Doe  
date: March 01, 2020  
output: html_document  
---
```

- YAML stands for 'YAML Ain't Markup Language'.
- It contains the metadata and options for the entire document such as the author name, date, output format, etc.
- The YAML header is surrounded before and after by a — on its own line.
- In RStudio a minimal YAML header is automatically created for you

Use YAML to add table of contents

```
---  
title: My first R markdown document  
author: Jane Doe  
date: March 01, 2020  
output:  
  html_document:  
    toc: yes  
---
```


Formatted text

Benthic Biodiversity experiment

These data were obtained from a mesocosm experiment which aimed to examine the effect of benthic polychaete (**Nereis diversicolor**) biomass on sediment nutrient (NH_4^+ , NO_3^- and PO_4^{3-}) release. At the start of the experiment replicate mesocosms were filled with 20 cm² of ****homogenised**** marine sediment and assigned to one of five polychaete biomass treatments (0, 0.5, 1, 1.5, 2 g per mesocosm).

Benthic Biodiversity experiment

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Markdown cheat sheets

- <https://www.markdownguide.org/cheat-sheet/>
- <https://www.rstudio.com/wp-content/uploads/2015/02/rmarkdown-cheatsheet.pdf>

Headings

```
# Benthic Biodiversity experiment
## Benthic Biodiversity experiment
### Benthic Biodiversity experiment
#### Benthic Biodiversity experiment
##### Benthic Biodiversity experiment
##### Benthic Biodiversity experiment
```

- Result in headings in decreasing size order.

Comments in markdown

```
<!--  
this is an example of a comment using R markdown.  
-->
```

- Same as HTML

Bullet lists

- item 1
 - item 2
 - sub-item 2
 - sub-item 3
 - item 3
 - item 4
- indent with spaces
 - can use + or —

Numbered lists

1. item 1

1. item 2

 + sub-item 2

 + sub-item 3

1. item 3

1. item 4

- will be numbered sequentially
- nested list can be numbered or not

Images

![Cute grey kitten](images/Cute_grey_kitten.jpg)



Images with the knitr package

```
““{r, echo=FALSE, fig.align='center', out.width='50%'}  
library(knitr)  
include_graphics("images/Cute_grey_kitten.jpg")  
““
```



Links

You can include a text for your
clickable `[link](https://www.worldwildlife.org)`

R code chunks

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

```
Any valid R code goes here
```

```
```
```

Don't echo the source code

```
““{r, summary-stats, echo=FALSE}  
x <- 1:10      # create an x variable  
y <- 10:1      # create a y variable  
dataf <- data.frame(x = x, y = y)  
summary(dataf)  
““
```

- summary-stats names the code chunk

Show the code but hide the results

```
““{r, summary-stats, results='hide'}  
x <- 1:10      # create an x variable  
y <- 10:1      # create a y variable  
dataf <- data.frame(x = x, y = y)  
summary(dataf)  
““
```

Run but hide both code and results

```
““{r, summary-stats, include=FALSE}  
x <- 1:10      # create an x variable  
y <- 10:1      # create a y variable  
dataf <- data.frame(x = x, y = y)  
summary(dataf)  
““
```

plots are shown immediately after the code chunk

```
““{r, simple-plot}  
x <- 1:10      # create an x variable  
y <- 10:1      # create a y variable  
dataf <- data.frame(x = x, y = y)  
plot(dataf$x, dataf$y, xlab = "x axis", ylab = "y axis")  
““
```

- Can change figure dimensions with `fig.width=` and `fig.height=` (in inches)
- Can change alignment with `fig.align=` ('center' or 'right')
- Captions with `fig.cap=`
- Hide with `fig.show='hide'`

Tables can be done in markdown

| x | y |
|---|---|
| 1 | 5 |
| 2 | 4 |
| 3 | 3 |
| 4 | 2 |
| 5 | 1 |

Tables using kable from knitr

```
““{r, kable-table}  
library(knitr)  
kable(iris[1:10,])  
““
```


R inline code

The square root of 2 is `'r sqrt(2)'`

The Definitive Guide

- <https://bookdown.org/yihui/rmarkdown/>