AGAPE: An introductory course to open science for early career researchers
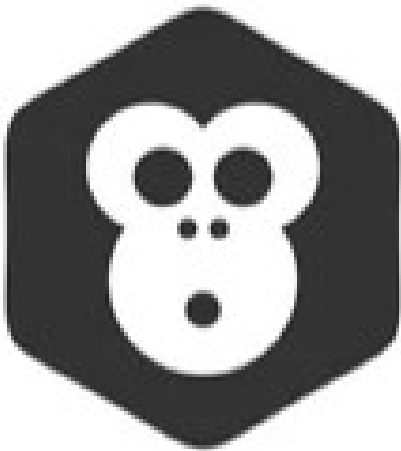
An Opening Doors initiative

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Contents

Introduction

Greetings, fellow PhD student or open science curious friend!

In this course, we would like to introduce you to the world of open science. Whether you are familiar with some of its concepts and resources or the open science movement doesn't ring any bells, we believe that what you learn here will be interesting for you and at the same time highly useful for your future career.

We ourselves are PhD students who firstly met during the course focusing on open and collaborative research. And because we felt that what we learned was very helpful and other students should have an opportunity to get familiar with these concepts too, we decided to create Agape. Agape means wide open, such as open science we want to promote. The word agapē originates from Greek and means love that is unconditional, such as our love for science. Under Agape we aim to disseminate open science between students, starting with this course and continuing with series of workshops where we can learn, exchange our opinions and experiences and together change the future.

With this course, Agape would like to open doors for you into the world of open science and to introduce various concepts that we think are very important but we were not told about. Whilst we all heard about the scientific integrity and open access publishing at some point of our studies, a domain of open science encompasses a much larger area. Given its extent, this course is by far not covering the whole scope of open science. However, during the course we provide you with useful links to other resources should you wish to learn more and start practising open science.

The course is structured into chapters that are written to expand on various topics. We think that an order they follow is logical and later chapters are building on knowledge in the previous ones, but you can decide to go through them in whatever order you like by clicking on different chapters in the menu on the left or to return to some of them should you find something is not clear or you forgot in the meantime.

Your progress throughout the course is tracked. At the end, you can obtain a Certificate of achievement. This will be generated for you automatically and

emailed to the email address you use to log into this course. In order to obtain this certificate you'll need to achieve at least 90% success rate in MCQs and activities at the end of each chapter. You have as many attempts to pass each of them as you want. Once you're happy with your result you confirm it and it will be saved under your profile until you confirm this for all chapters. After completing the last one, allow it a couple of hours before you receive the certificate.

Should you experience any technical problems or do not receive a certificate email us on

If you'd like to connect with us or see what's new you can do so on Twitter or Instagram (or any other social media account).

And now, without further delay, let's quench that thirst for knowledge! ## Structure of the book {-}

How to read this book

How to read the web edition

Try these toolbar features located near the top of your browser:

- Menu
- Search
- Font to adjust text size and display
- View source code on GitHub (if available)
- Download book files (if available)
- Shortcuts (arrow keys to navigate; `s` to toggle sidebar; `f` to toggle search)
- Social Media
- Share
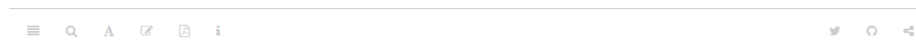
Figure 1: Toolbar features in open-access web edition

What did we leave out?

About Opening Doors project

Meet the authors

Acknowledgement

How to contribute to this project

Disclaimer

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In tip boxes like this one, we'll point out design tips, to help you keep your page looking looking

These tips highlight advice and tricks from community members.

As you work, you may start a local server to live preview this HTML book. This preview will update as you edit the book when you save individual .Rmd files. You can start the server in a work session by using the RStudio add-in "Preview book", or from the R console:

```
bookdown::serve_book()
```

Chapter 1

Chapter 1: Introduction to open science

Bullet points: Defining science: "systematic enterprise that builds and organise knowledge in the form of testable explanations and predictions about the universe" [...] science performs knowledge validation "through (the) sharing of findings and data and through peer review". That is, sharing these knowledge bits with other scientists *is* the method for evaluating their truthiness and validity. This process is called *peer-reviewing.* Isn't science open already? What is the current "openness" status and how it changed over time? When and where does the term open science come from? Why we do NOT need open science: The misuse of openly available dual-edge knowledge The misinterpretation and misunderstanding of openly available knowledge from the amateurs and the general public. The degradation of the peer-review process and the advent of predatory "open" journals. The commodification of scientific knowledge, where knowledge is only apparently /free/ but the user becomes the product The monopoly of the western world in designing open science. The costs of higher accessibility to data and publications. The absence of metrics in evaluating and recognizing one's efforts in generating and maintaining openly available knowledge. The risks of extreme rigour hindering exploratory research. Why we DO need open science: The open science currents: opening what and how? Developing and building infrastructure that help scientists practice open science Implement new evaluation processes for scientists to progress in their career based also upon their degree of "openness" Dedicating time to improve knowledge divulgation, comprehensibility, and accessibility Removing legal barriers that limit a complete access to the generated knowledge Pragmatic approach ("as open as possible as close as necessary") The key challenges Going past the traditional scientific community Knowledge validation without economical barriers or conflict of interest Multilingual knowledge Educating a new generation of scientists Costs and infrastructures Monitoring the status of open science

Chapter 2

Chapter 2: Open research, open data, open access

2.0.1 Minimal Q:

any header + at least two options.

- ☒ Correct Option
- ☐ Incorrect Options needed for Moodle.

2.0.2 Markdown -> Code Highlighting

```python
def take_default_list(xs = []):
xs.append(7)
return sum(xs) # this is a comment.
```

What is the output of `take_default_list([1,2,3])`?

- ☒ It's impossible to know.
- ☐ 13
- ☐ Something else.

2.0.3 Headings trigger new questions!

What is 3 + 4?

Ordered options never get shuffled!

☐ 5
☐ 6
☒ 7
☐ 8

2.1 Dictionary Review:

```python
x = {1: 2, 3: 4, 5: 6}
print(x[4])
```

What happens here?

☐ 3
☐ 4
☐ True
☐ False
☒ Crash!

Chapter 3

Chapter 3: Pros and cons

3.1   Testing google form based quiz

Loading...

Chapter 4

Chapter 4: Research data lifecycle

4.1 Create quiz using learnr package

Chapter 5

Chapter 5: FAIR principles

Chapter 6

Chapter 6: Data centers and data repositories

Chapter 7

Chapter 7: Policies

Chapter 8

Chapter 8: Data ethics

Chapter 9

Chapter 9: Coding and other skills

Chapter 10

Chapter 10: Communication and ethics of open science

Chapter 11

Chapter 11: Opening your research

Chapter 12

Chapter 12: Conclusion

Chapter 13

Chapter 13: How to contact us

Chapter 14

Chapter 6: Data centers and data repositories

Chapter 15

Chapter 12: Conclusion

Chapter 16

Hello bookdown

All chapters start with a first-level heading followed by your chapter title, like the line above. There should be only one first-level heading (`#`) per .Rmd file.

16.1   A section

All chapter sections start with a second-level (`##`) or higher heading followed by your section title, like the sections above and below here. You can have as many as you want within a chapter.

An unnumbered section

Chapters and sections are numbered by default. To un-number a heading, add a `{.unnumbered}` or the shorter `{-}` at the end of the heading, like in this section.

Chapter 17

Cross-references

Cross-references make it easier for your readers to find and link to elements in your book.

17.1 Chapters and sub-chapters

There are two steps to cross-reference any heading:

1. Label the heading: `# Hello world {#nice-label}`.

   - Leave the label off if you like the automated heading generated based on your heading title: for example, `# Hello world` = `# Hello world {#hello-world}`.
   - To label an un-numbered heading, use: `# Hello world {-#nice-label}` or `{# Hello world .unnumbered}`.

2. Next, reference the labeled heading anywhere in the text using `\@ref(nice-label)`; for example, please see Chapter 17.

   - If you prefer text as the link instead of a numbered reference use: any text you want can go here.

17.2 Captioned figures and tables

Figures and tables *with captions* can also be cross-referenced from elsewhere in your book using `\@ref(fig:chunk-label)` and `\@ref(tab:chunk-label)`, respectively.

See Figure 17.1.

```
par(mar = c(4, 4, .1, .1))
plot(pressure, type = 'b', pch = 19)
```


Figure 17.1: Here is a nice figure!

Don't miss Table 17.1.

```
knitr::kable(
  head(pressure, 10), caption = 'Here is a nice table!',
  booktabs = TRUE
)
```

Table 17.1: Here is a nice table!

temperature	pressure
0	0.0002
20	0.0012
40	0.0060
60	0.0300
80	0.0900
100	0.2700
120	0.7500
140	1.8500
160	4.2000
180	8.8000

Chapter 18

Parts

You can add parts to organize one or more book chapters together. Parts can be inserted at the top of an .Rmd file, before the first-level chapter heading in that same file.

Add a numbered part: `# (PART) Act one {-}` (followed by `# A chapter`)

Add an unnumbered part: `# (PART\*) Act one {-}` (followed by `# A chapter`)

Add an appendix as a special kind of un-numbered part: `# (APPENDIX) Other stuff {-}` (followed by `# A chapter`). Chapters in an appendix are prepended with letters instead of numbers.

Chapter 19

Footnotes and citations

19.1 Footnotes

Footnotes are put inside the square brackets after a caret `^[]`. Like this one [1].

19.2 Citations

Reference items in your bibliography file(s) using `@key`.

For example, we are using the **bookdown** package (Xie, 2022) (check out the last code chunk in index.Rmd to see how this citation key was added) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015) (this citation was added manually in an external file book.bib). Note that the `.bib` files need to be listed in the index.Rmd with the YAML `bibliography` key.

The RStudio Visual Markdown Editor can also make it easier to insert citations: https://rstudio.github.io/visual-markdown-editing/#/citations

---

[1] This is a footnote.

Chapter 20

Blocks

20.1 Equations

Here is an equation.

$$f(k) = \binom{n}{k} p^k (1-p)^{n-k} \tag{20.1}$$

You may refer to using `\@ref(eq:binom)`, like see Equation (20.1).

20.2 Theorems and proofs

Labeled theorems can be referenced in text using `\@ref(thm:tri)`, for example, check out this smart theorem 20.1.

Theorem 20.1. *For a right triangle, if c denotes the* length *of the hypotenuse and a and b denote the lengths of the **other** two sides, we have*

$$a^2 + b^2 = c^2$$

Read more here https://bookdown.org/yihui/bookdown/markdown-extensions-by-bookdown.html.

20.3 Callout blocks

The R Markdown Cookbook provides more help on how to use custom blocks to design your own callouts: https://bookdown.org/yihui/rmarkdown-cookbook/custom-blocks.html

Chapter 21

Sharing your book

21.1 Publishing

HTML books can be published online, see: https://bookdown.org/yihui/bookdown/publishing.html

21.2 404 pages

By default, users will be directed to a 404 page if they try to access a webpage that cannot be found. If you'd like to customize your 404 page instead of using the default, you may add either a `_404.Rmd` or `_404.md` file to your project root and use code and/or Markdown syntax.

21.3 Metadata for sharing

Bookdown HTML books will provide HTML metadata for social sharing on platforms like Twitter, Facebook, and LinkedIn, using information you provide in the `index.Rmd` YAML. To setup, set the `url` for your book and the path to your `cover-image` file. Your book's `title` and `description` are also used.

This `gitbook` uses the same social sharing data across all chapters in your book-all links shared will look the same.

Specify your book's source repository on GitHub using the `edit` key under the configuration options in the `_output.yml` file, which allows users to suggest an edit by linking to a chapter's source file.

Read more about the features of this output format here:

https://pkgs.rstudio.com/bookdown/reference/gitbook.html

Or use:

```
?bookdown::gitbook
```

Bibliography

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.

Xie, Y. (2022). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.26.