What's next?

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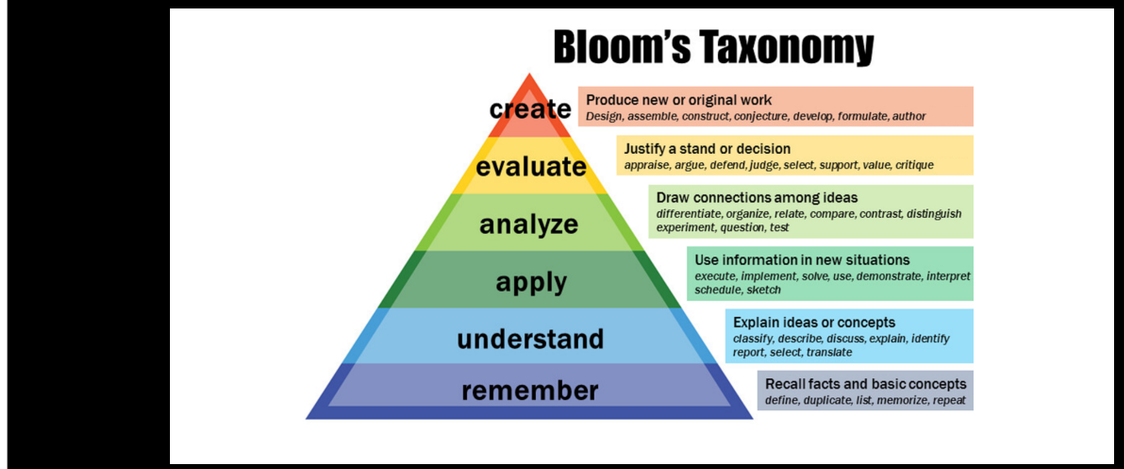
We've now finished the workshop, and I'm sure many of you are wondering "What's next?"



Bloom's Taxonomy

What is means to "know something well".

This is "Bloom's Taxonomy". It was created by Benjamin Bloom, who was an educational psychologist. It seeks to answer "What does it mean to know a field", and it can be used in R as well. Applying this to our workshop:

The reason I gave you handouts, and asked you to write a summary of what you learned along the way, is to help you remember what you've learned.

The reason why I lectured was to help you understand the code.

And the reason why I gave you exercises was to help you apply what you learned. This is the basic hierarchy of learning.

If you want to continue improving at R, you should work with your supervisor to get more chances to apply what you learned in the workshop. In R, the "apply" phase lasts a very long time, because data is always different, there are a ton of crypic error messages, and so on.

3 Levels of R Programming

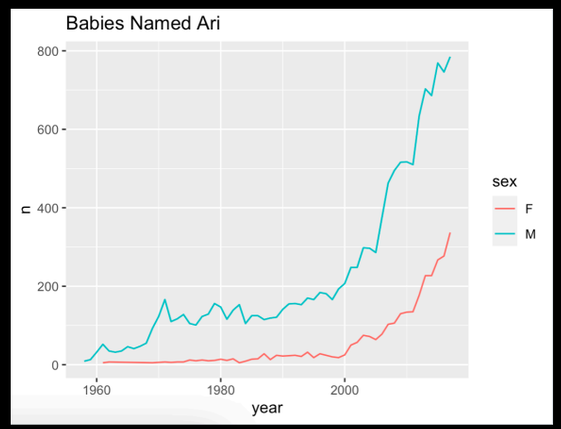
1. A single analysis (scripts)
2. Programs to do multiple analysis (functions)
3. Sharing programs (packages, shiny)

I'd now like to explain why you might want to continue to learn R. What you learned in this workshop was how to do a single analysis in R. This is a great place to start. But the truth is that you can do that with lots of other tools. What makes R special, I think, is that it's a full-fledged programming language. And I'd like to talk for a minute about what that means.

A Single Analysis (Scripts)

```
library(ggplot2)
library(babynames)

babynames %>%
  filter(name == "Ari") %>%
  ggplot(aes(year, n, color=sex)) +
  geom_line() +
  ggtitle("Babies Named Ari")
```



This is an example of a single analysis. You're given a dataset of baby name popularity, and you create a graph that shows the popularity of a single name over time.

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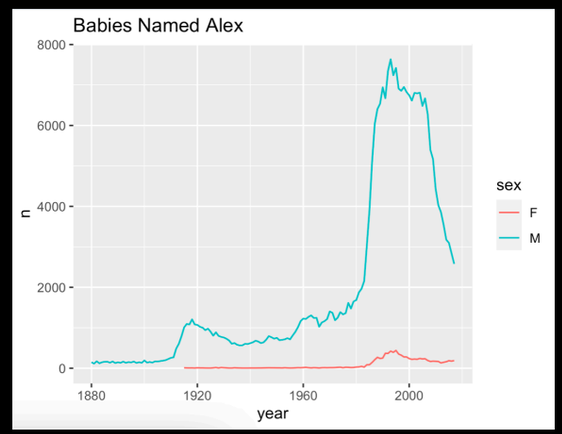
I think that R gets really interesting when you start writing functions in it. Let me explain.

Programs to do multiple analyses

```
library(ggplot2)
library(babynames)
library(glue)

baby_name_graph = function(baby_name) {
  babynames %>%
    filter(name == baby_name) %>%
    ggplot(aes(year, n, color=sex)) +
    geom_line() +
    ggtitle(glue("Babies Named {baby_name}"))
}

baby_name_graph("Alex")
```



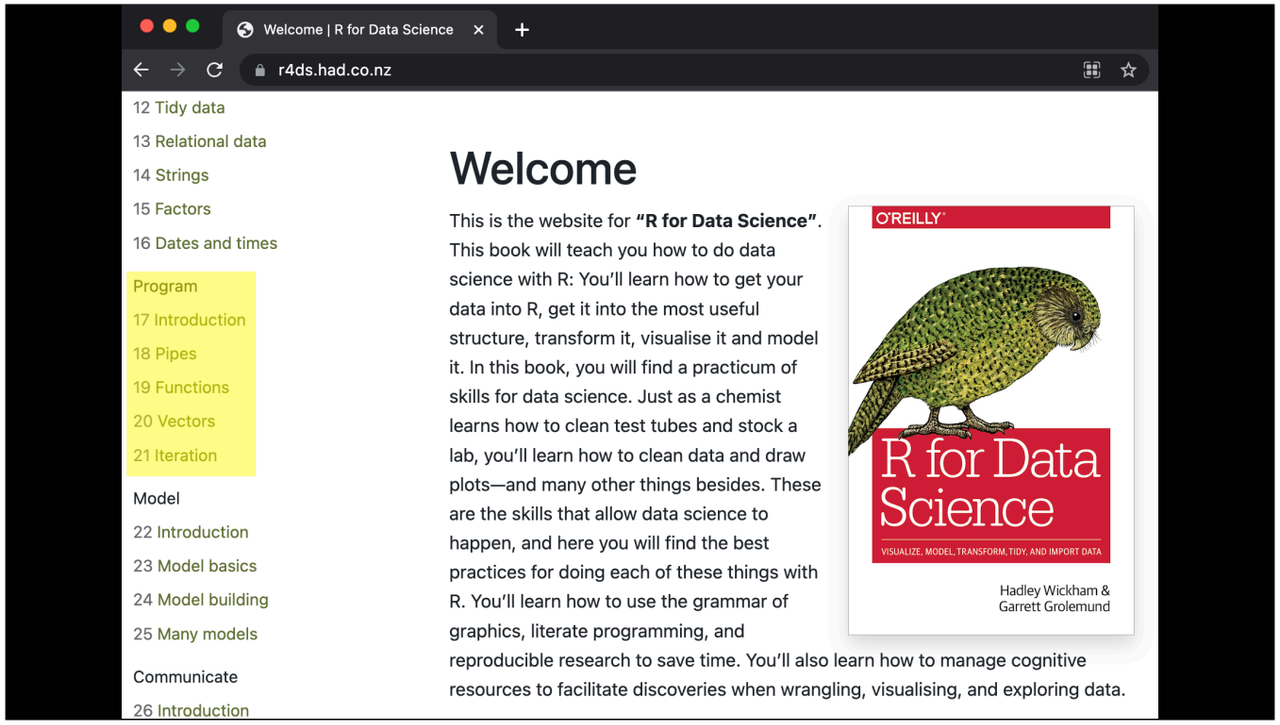
Here I encapsulated all the code to create a graph of name popularity in a single function called "baby_name_graph". It takes a parameter called baby_name, and then makes a graph of that name's popularity. As a proof of concept, I am calling it with the parameter "Alex".

What does this do?

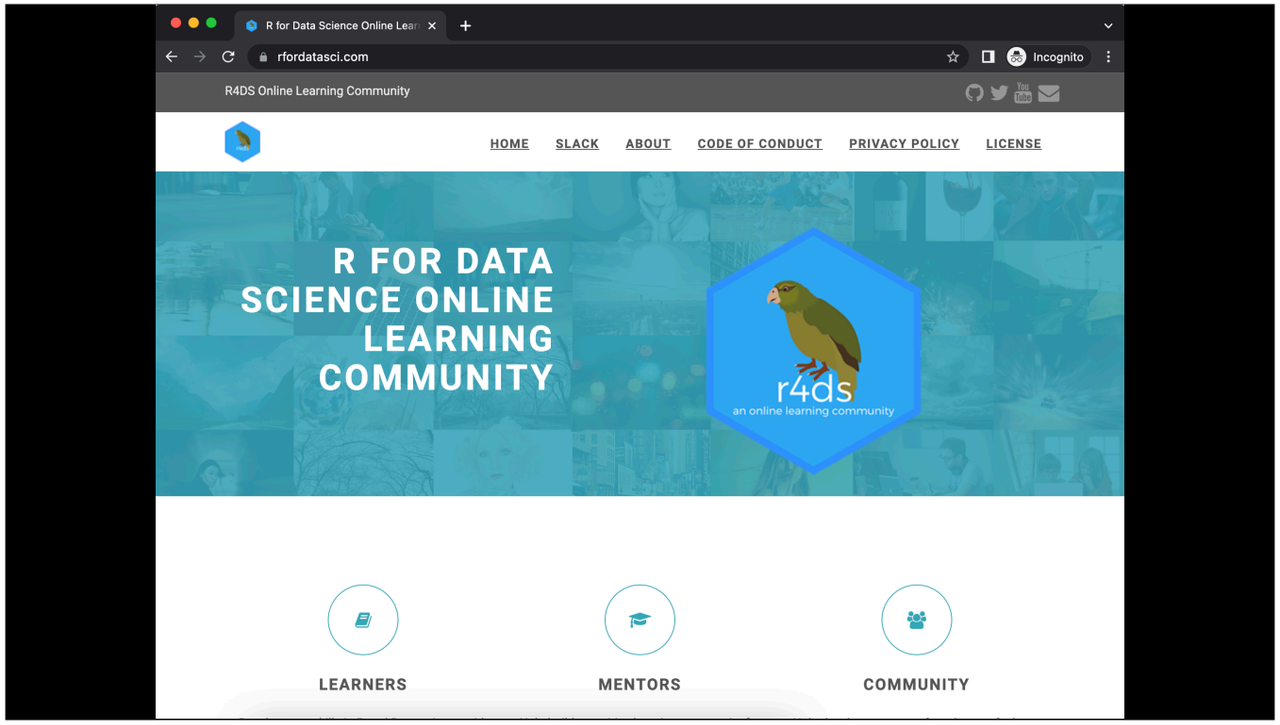
```
# Don't try this at home
all_names = unique(babynames$name)
for (one_name in all_names) {
  baby_name_graph(one_name)
}
```

Once you encapsulate an analysis in a function, an entire new world of options opens up. Can you guess what this program does?

Once you become fluent in writing a single analysis, the next step is start packing up useful components of those analyses into functions, and then reusing them in new ways. The analyses that you spend so much time perfecting become something you can reuse instantaneously in another context. This is why people love R.



The best introduction to programming in R is probably the "Program" section of "R for Data Science". Specifically the sections on functions and iteration.



I also want to mention the R for Data Science Learning Community. While I haven't joined it myself, I have heard good things about it. If you wind up joining, I'd love to know about your experience.

3 Levels of R Programming

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Finally, R lets you share your programs with other people in two really novel ways: packages and Shiny. This is another reason, I think, why people love using R: when you finish doing a single analysis, you can do so much more with it.

Packages

```
library(myPackage)

baby_name_graph("Andy")
```

An R package lets you encapsulate all the code and dependencies of your analysis.

Here we packaged up our babyname graphing function in the package "myPackage". The end user can use that function without knowing about the babynames package, the tidyverse, and so on.

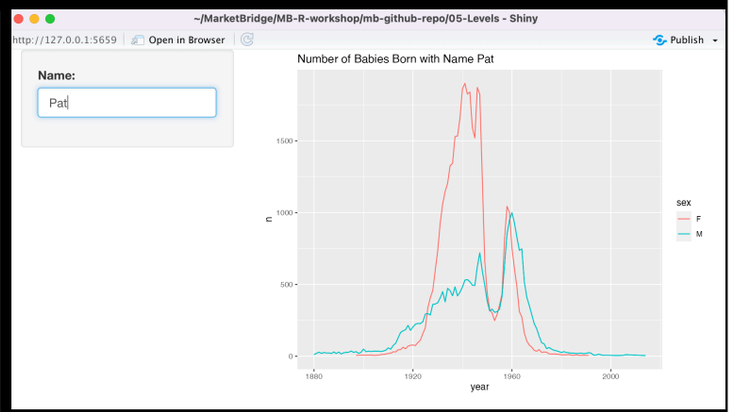
Shiny - Interactive Web Application

```r
library(shiny)
library(babynames)
library(tidyverse)
library(scales)

ui <- fluidPage(
  sidebarLayout(
    sidebarPanel(
      textInput("name", "Name:", value="Ari")
    ),
    mainPanel(
      plotOutput("namePlot")
    )
  )
)

server <- function(input, output) {
  output$namePlot <- renderPlot({
    title = paste0("Number of Babies Born with Name ", input$name)
    babynames %>%
      filter(name == input$name) %>%
      ggplot() +
      geom_line(aes(year,n, color=sex)) +
      ggtitle(title)
  })
}

# Run the application
shinyApp(ui = ui, server = server)
```



Packages have been around for a long time. Shiny is much newer. Here's an app that lets you enter any name into a web application and get a graph of that name's popularity over time. Here's the R code to create it.

Closing Thought

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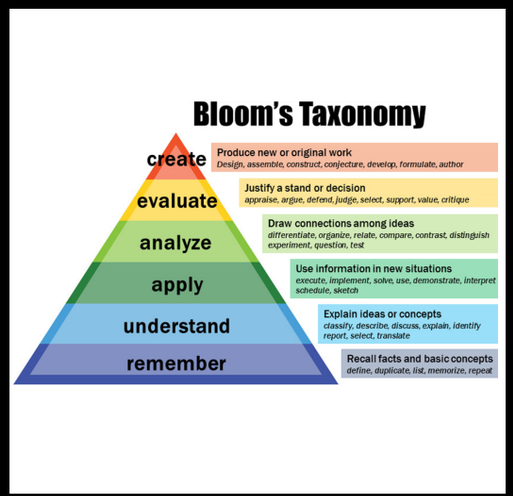
2. Programs to do multiple analysis (functions)
3. Sharing programs (packages, shiny)



If you'd like to continue to improve at R, please just seek out opportunities to apply what you've learned in this workshop to your projects.