Teach the tidyverse to beginners

David Robinson
DataCamp

Teach the Tidyverse

Teach the Tidyverse

Data Science in the Tidyverse
Charlotte Wickham
This is a two-day hands on workshop based on the book R for Data Science. This workshop is designed for people who are familiar with R and want to learn how to achieve their data analysis goals the "tidy" way. You will learn how to visualize, transform, and model data in R and work with date-times, character strings, and untidy data formats. Along the way, you will learn and use many packages from the tidyverse including ggplot2, dplyr, tidyr, readr, purrr, tibble, stringr, lubridate, and forcats.

The "what"

Teach the Tidyverse

Data Science in the Tidyverse
Charlotte Wickham
This is a two-day hands on workshop based on the book R for Data Science. This workshop is designed for people who are familiar with R and want to learn how to achieve their data analysis goals the "tidy" way. You will learn how to visualize, transform, and model data in R and work with date-times, character strings, and untidy data formats. Along the way, you will learn and use many packages from the tidyverse including ggplot2, dplyr, tidyr, readr, purrr, tibble, stringr, lubridate, and forcats.

The "what"

Tidyverse Train-the-Trainer
Garrett Grolemund

This two day workshop will equip you to teach R effectively. We will draw on RStudio's experience teaching R to recommend tips for designing, teaching, and supporting short R courses. You will learn practical activities that you can use immediately to improve your presentation style, learning outcomes, and student engagement. Classroom examples will focus on teaching Master the Tidyverse, a two day workshop developed by RStudio; as well as on using RStudio Cloud and its curriculum of tutorials to jump-start your own lessons. You will leave the class with a cognitive model of learning that you can use to develop your own effective workshops or courses within your organization. Participants will receive the course materials for Master the Tidyverse as well as a certificate of completion.

The "how"

Why Teach the Tidyverse?

Data Science in the Tidyverse
Charlotte Wickham
This is a two-day hands on workshop based on the book R for Data Science. This workshop is designed for people who are familiar with R and want to learn how to achieve their data analysis goals the "tidy" way. You will learn how to visualize, transform, and model data in R and work with date-times, character strings, and untidy data formats. Along the way, you will learn and use many packages from the tidyverse including ggplot2, dplyr, tidyr, readr, purrr, tibble, stringr, lubridate, and forcats.

The "what"

Tidyverse Train-the-Trainer
Garrett Grolemund

This two day workshop will equip you to teach R effectively. We will draw on RStudio's experience teaching R to recommend tips for designing, teaching, and supporting short R courses. You will learn practical activities that you can use immediately to improve your presentation style, learning outcomes, and student engagement. Classroom examples will focus on teaching Master the Tidyverse, a two day workshop developed by RStudio; as well as on using RStudio Cloud and its curriculum of tutorials to jump-start your own lessons. You will leave the class with a cognitive model of learning that you can use to develop your own effective workshops or courses within your organization. Participants will receive the course materials for Master the Tidyverse as well as a certificate of completion.

The "how"

Posts on Variance Explained

December 16, 2014	**Don't teach built-in plotting to beginners (teach ggplot2)**
February 12, 2016	**Why I use ggplot2**
July 5, 2017	**Teach the tidyverse to beginners**
September 21, 2017	**Don’t teach students the hard way first**

varianceexplained.org/posts/

How do I recommend teaching R?

Have goals for what you want your students to do,
and start them doing it as early as possible.

Have goals for what you want your students to do,
and start them doing it as early as possible.

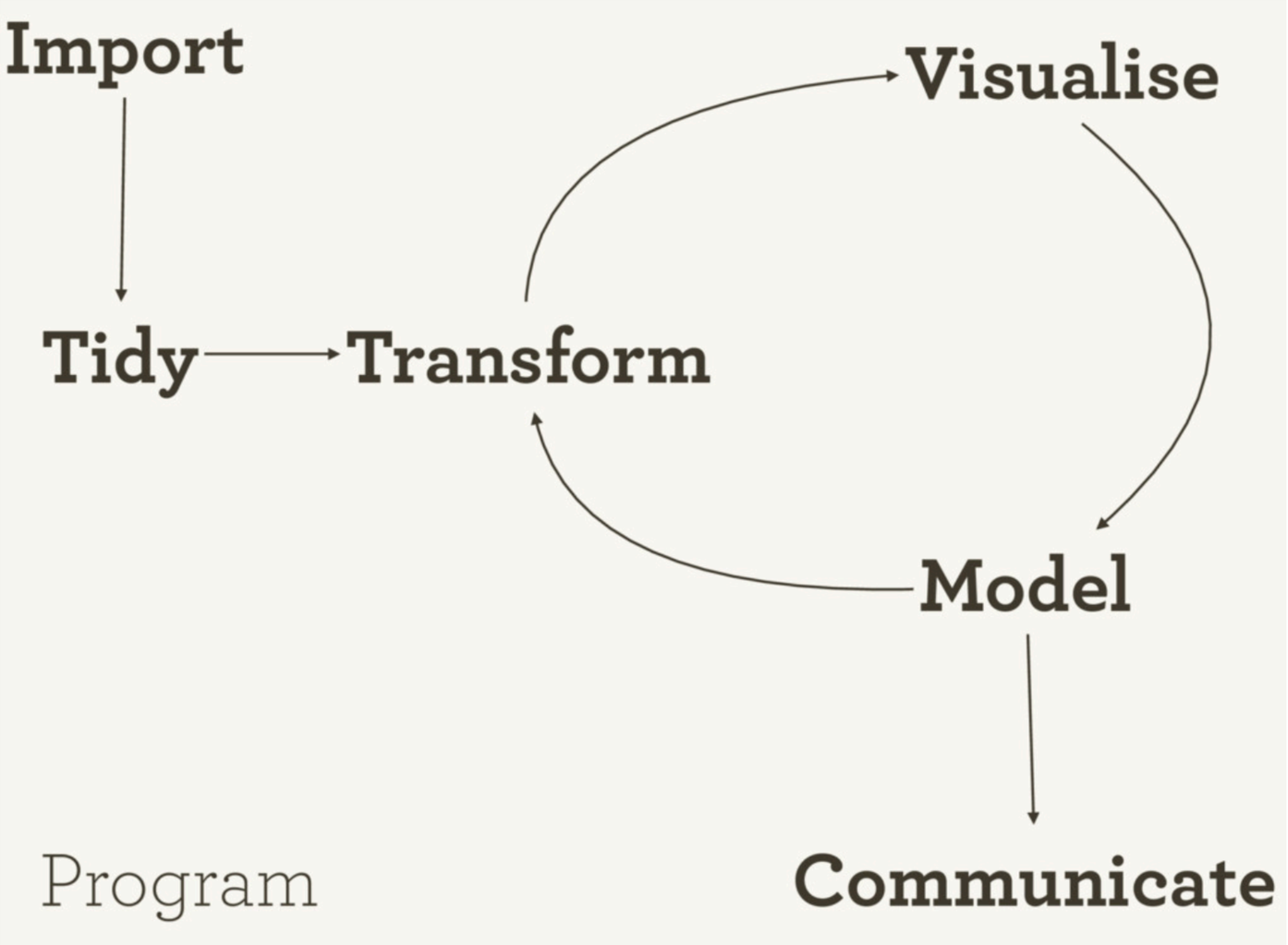
Have goals for what you want your students to do,
and start them doing it as early as possible.

- Order matters

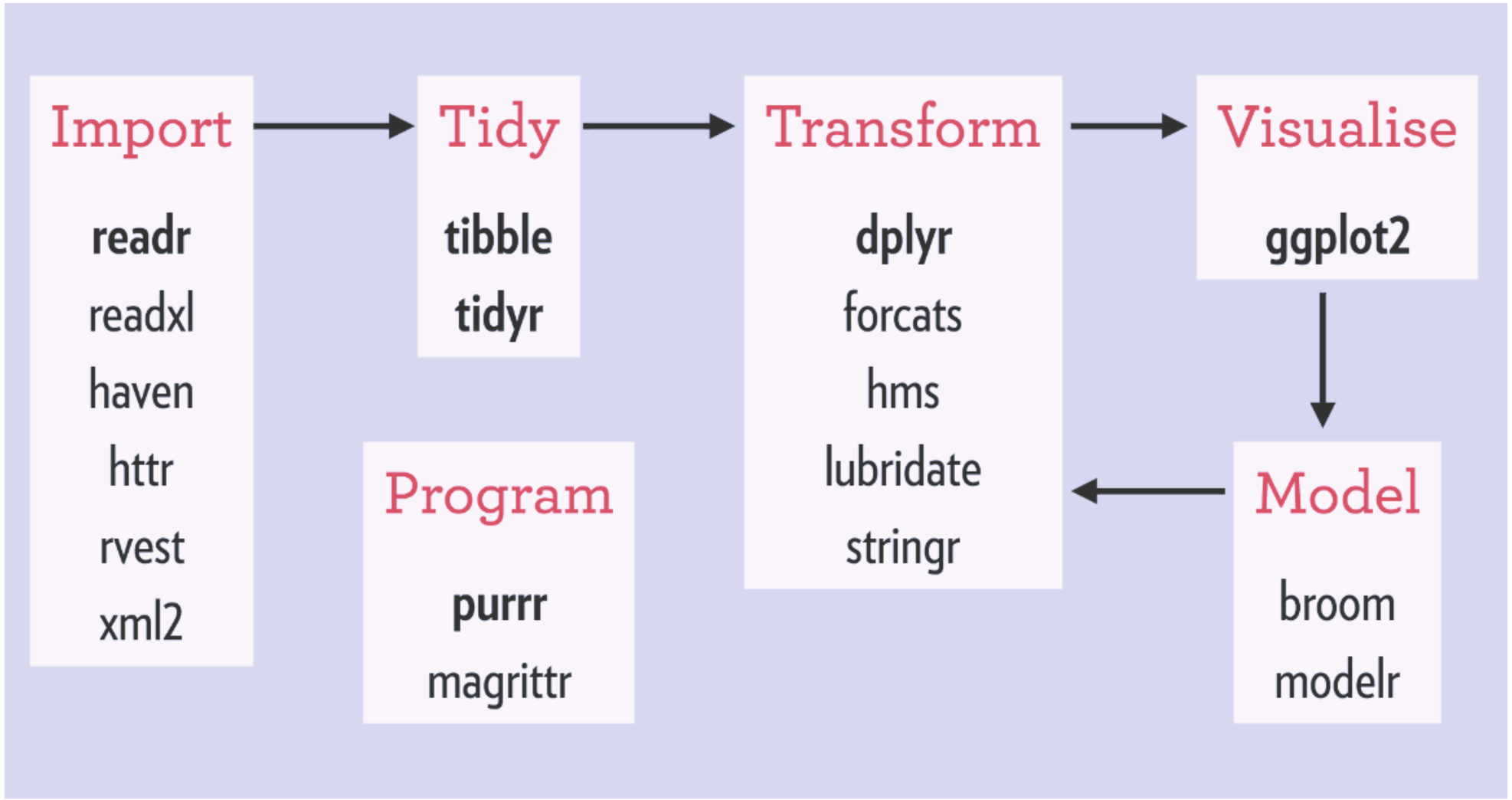
Have goals for what you want your students to do,
and start them doing it as early as possible.

- Order matters
- When you teach something, show why it’s useful

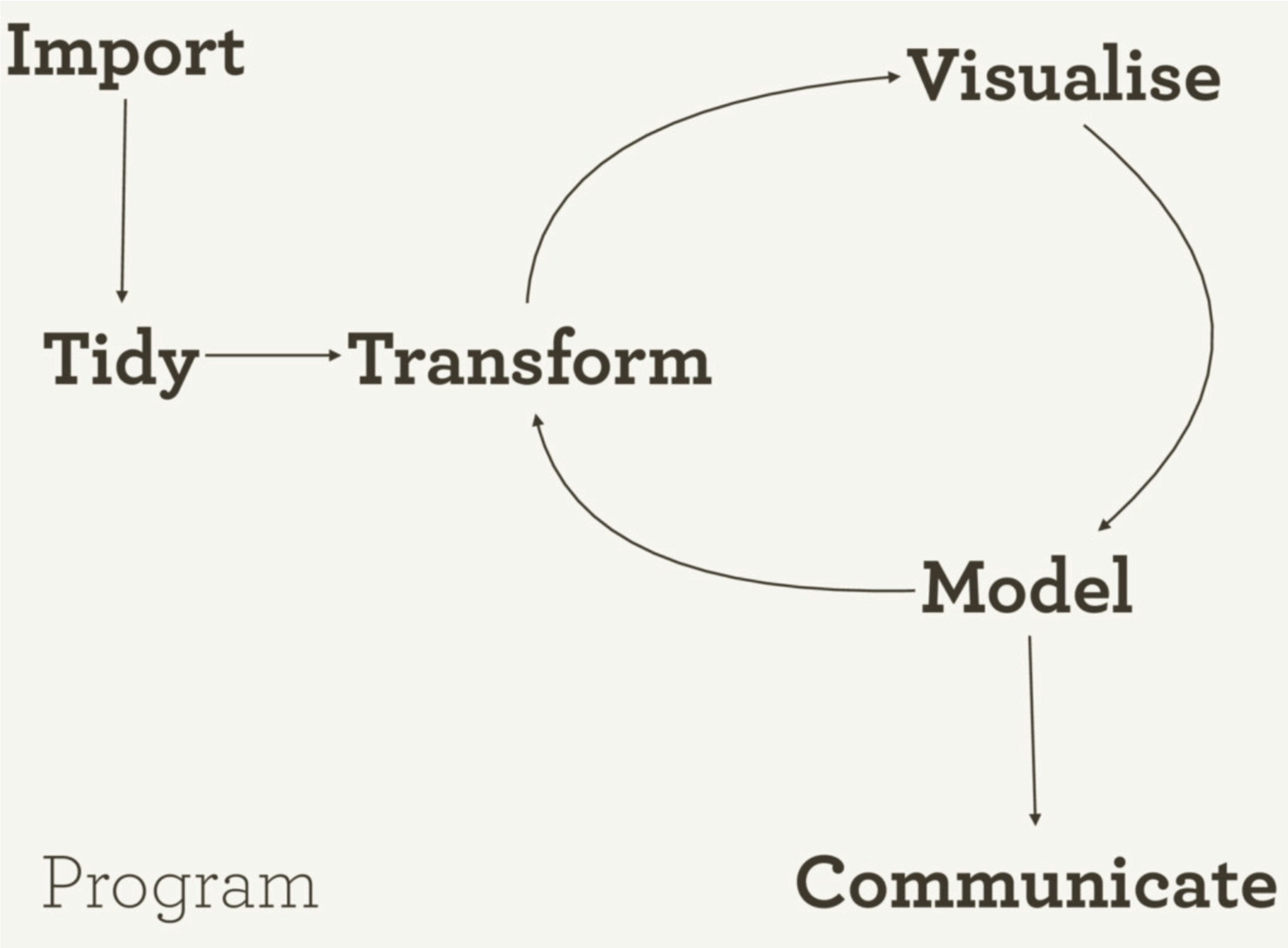
I want students to understand their data



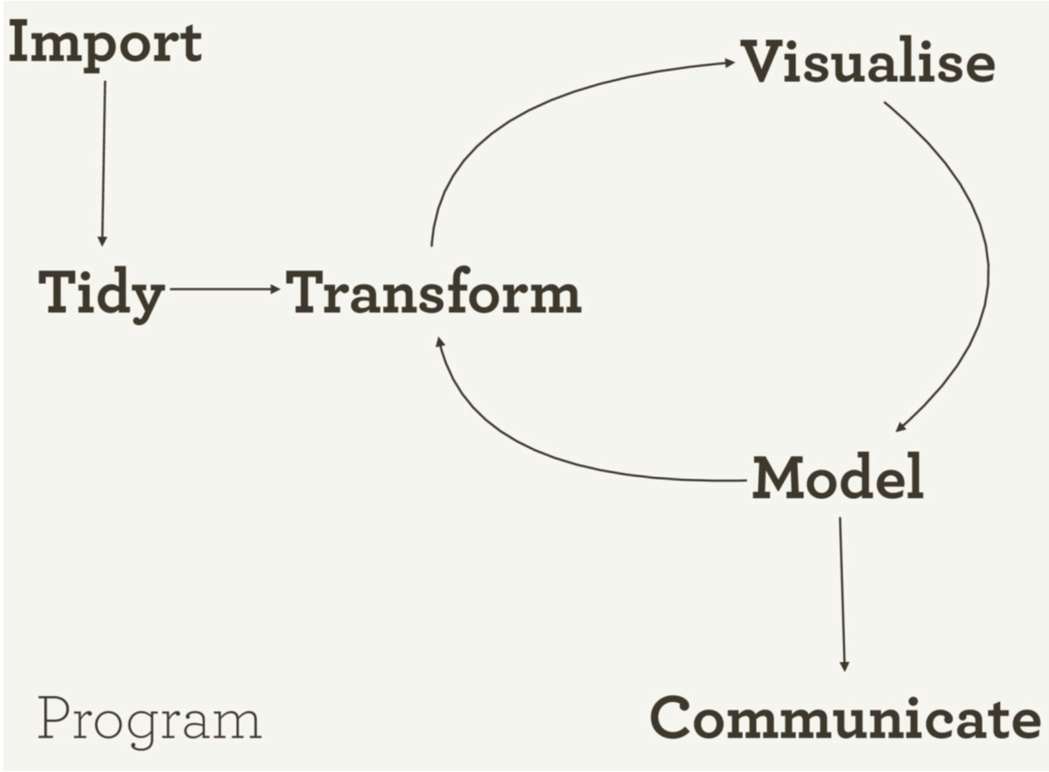
I want students to understand their data



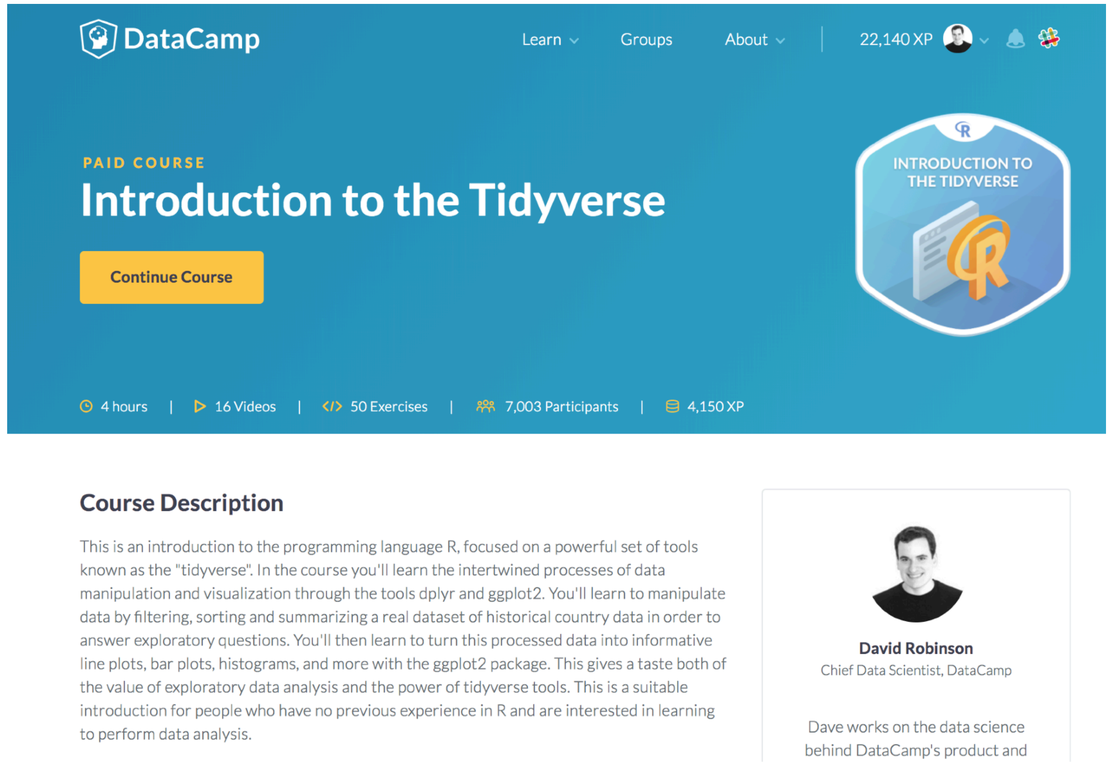
I want students to understand their data

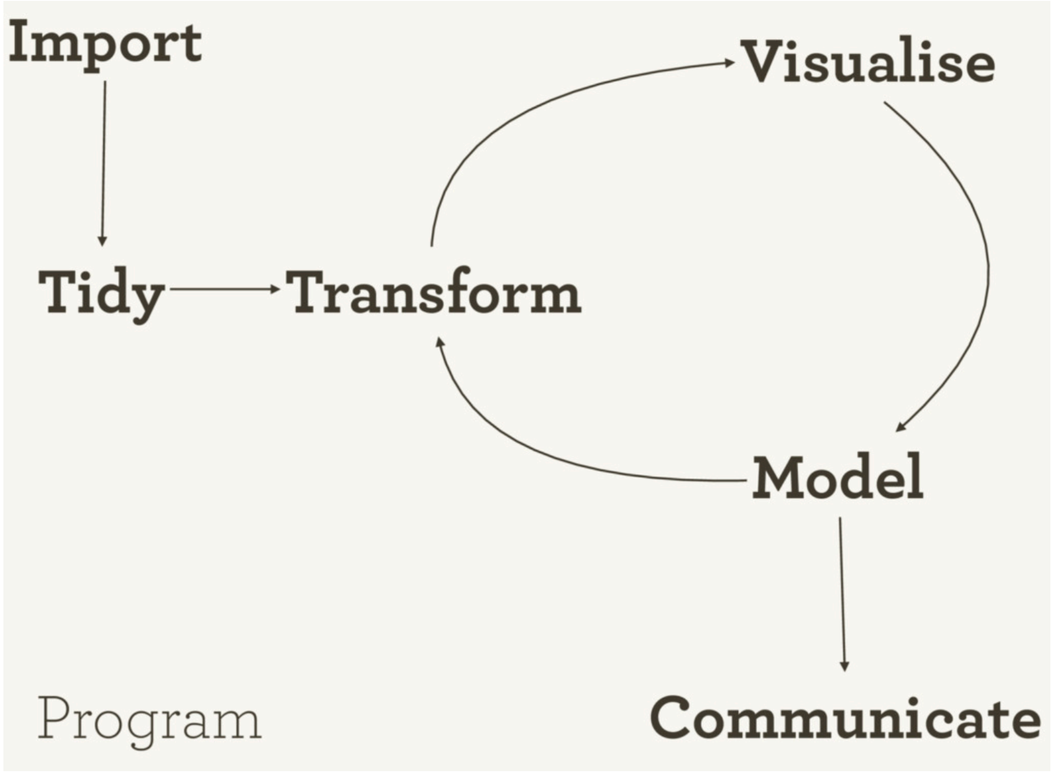


I want students to understand their data



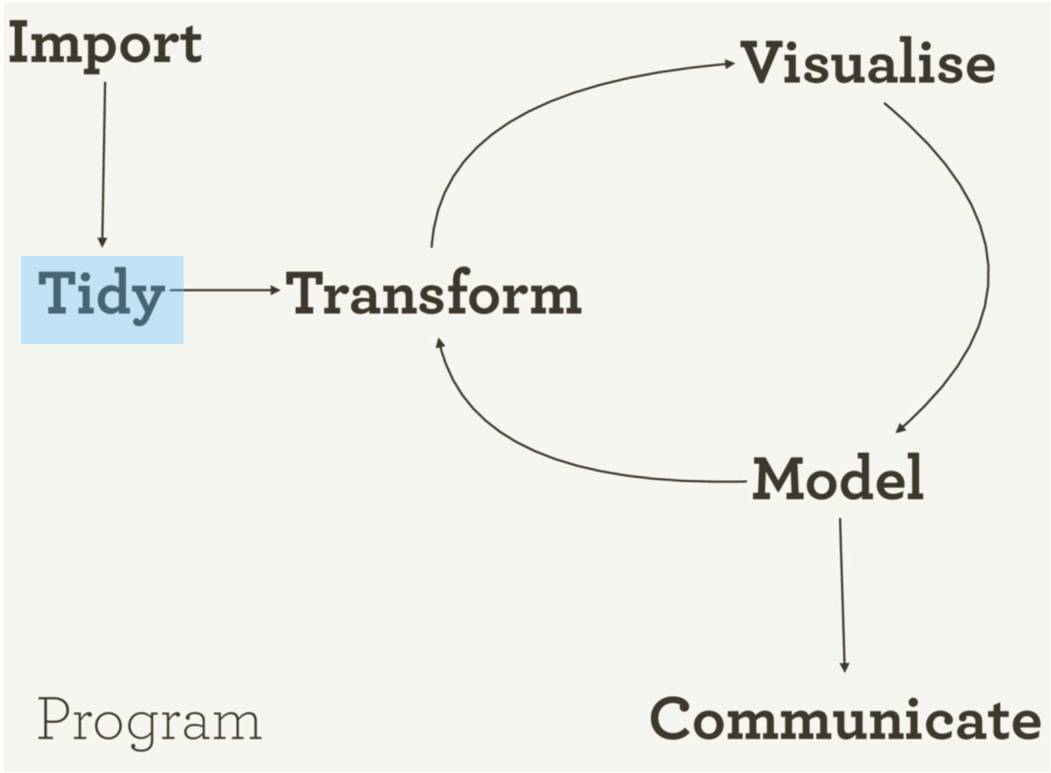
I want students to understand their data





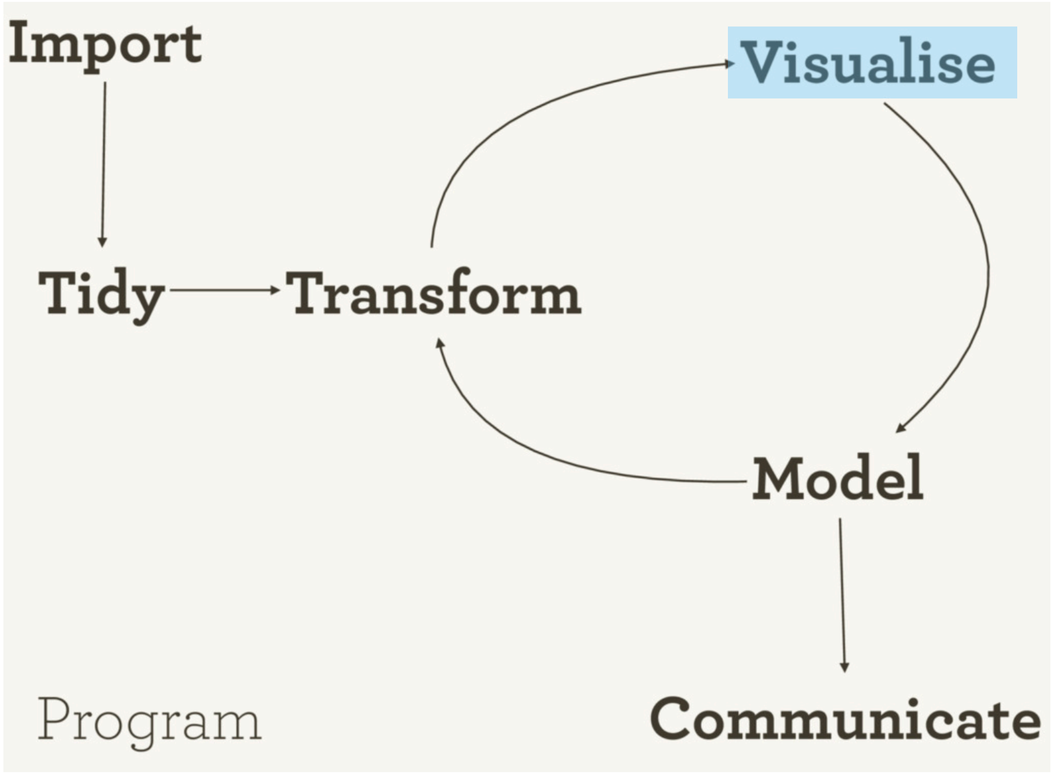
I want students to understand their data

1. Data wrangling



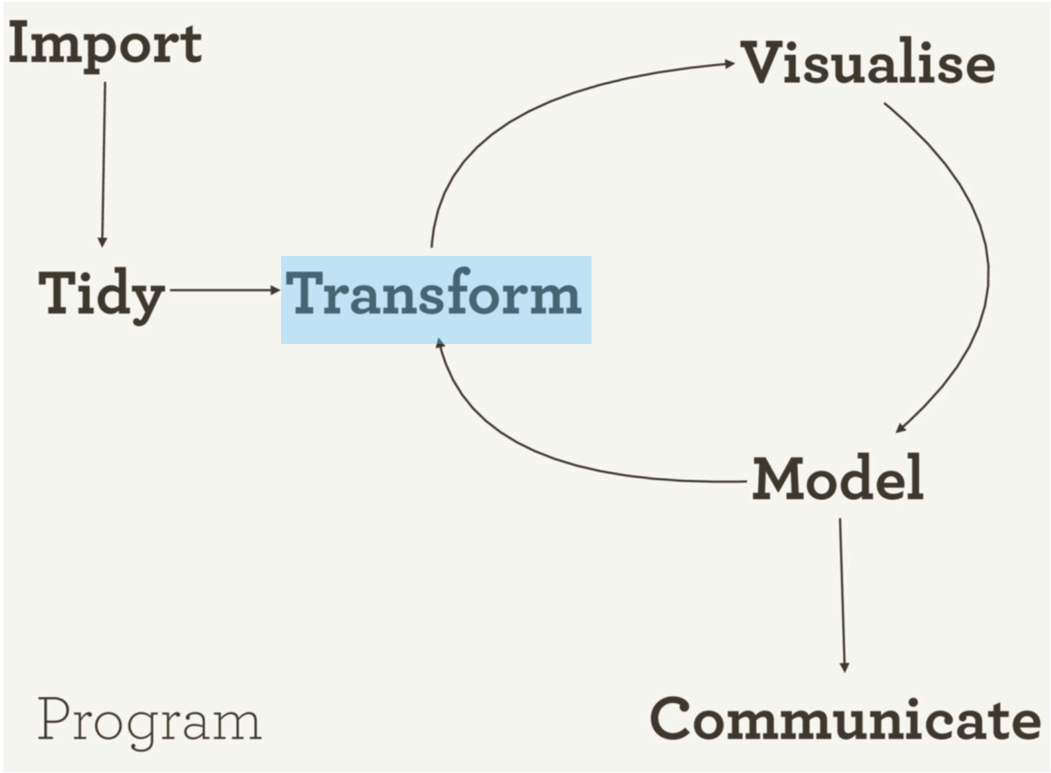
I want students to understand their data

1. Data wrangling
2. Data visualization



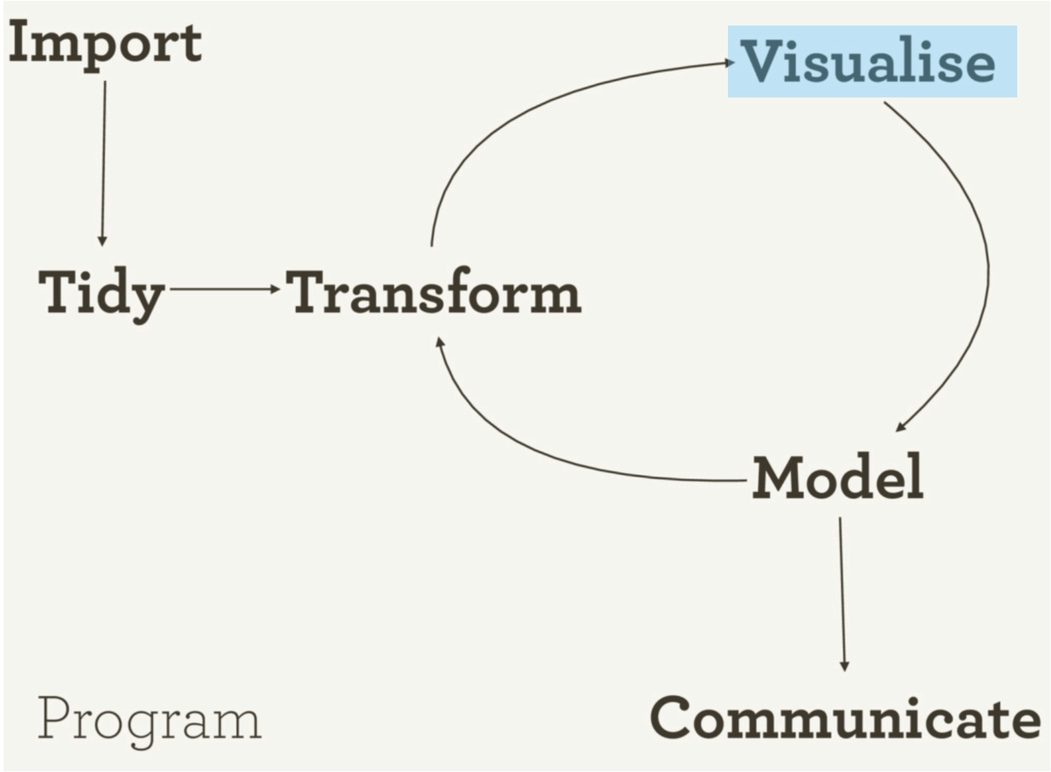
I want students to understand their data

1. Data wrangling
2. Data visualization
3. Grouping and summarizing

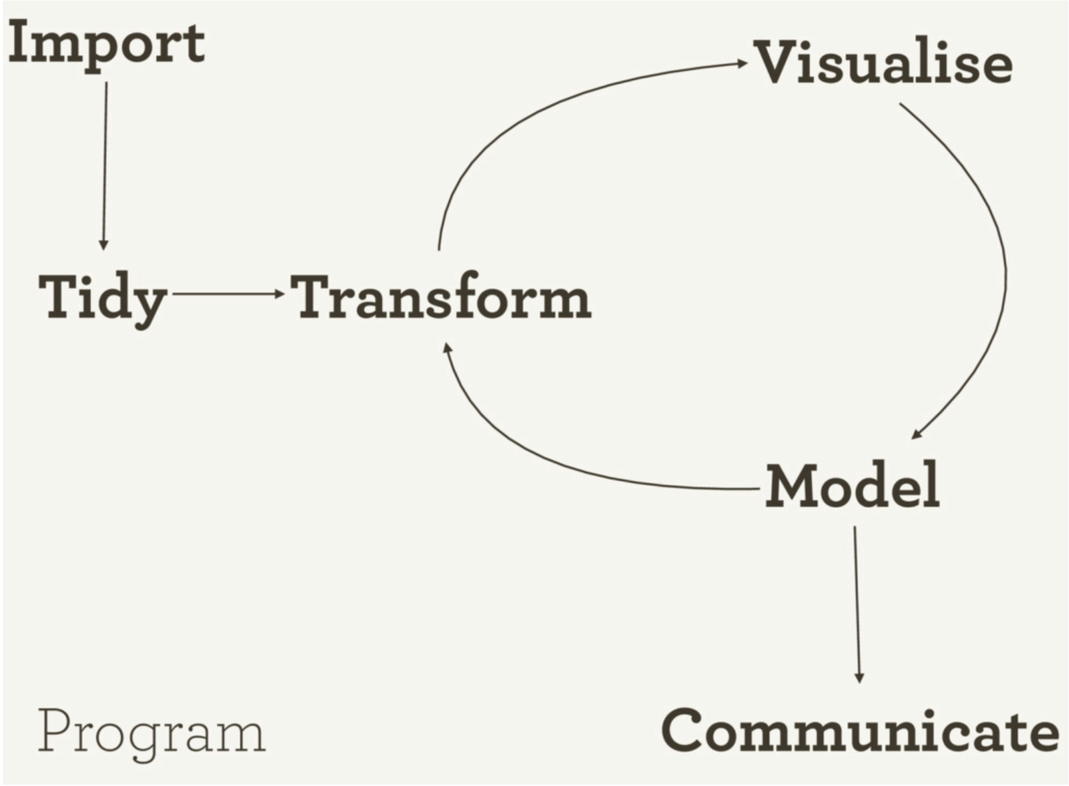


I want students to understand their data

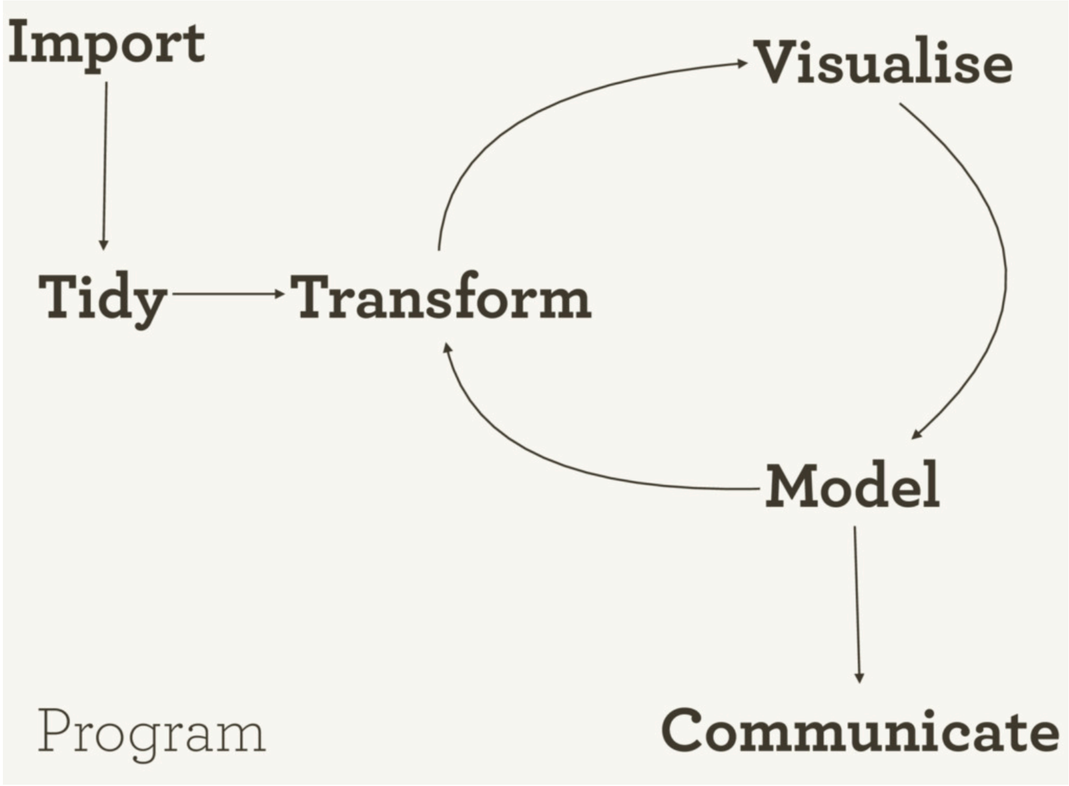
1. Data wrangling
2. Data visualization
3. Grouping and summarizing
4. Types of visualizations



I want students to understand their data

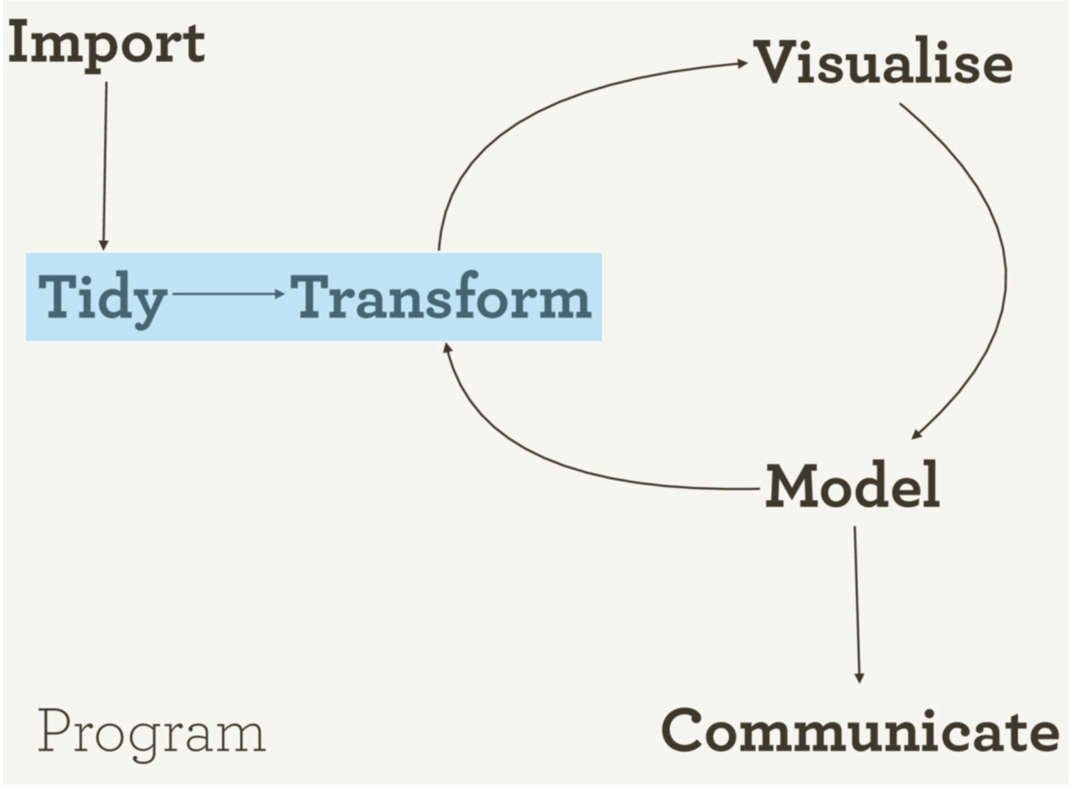


I want students to understand their data



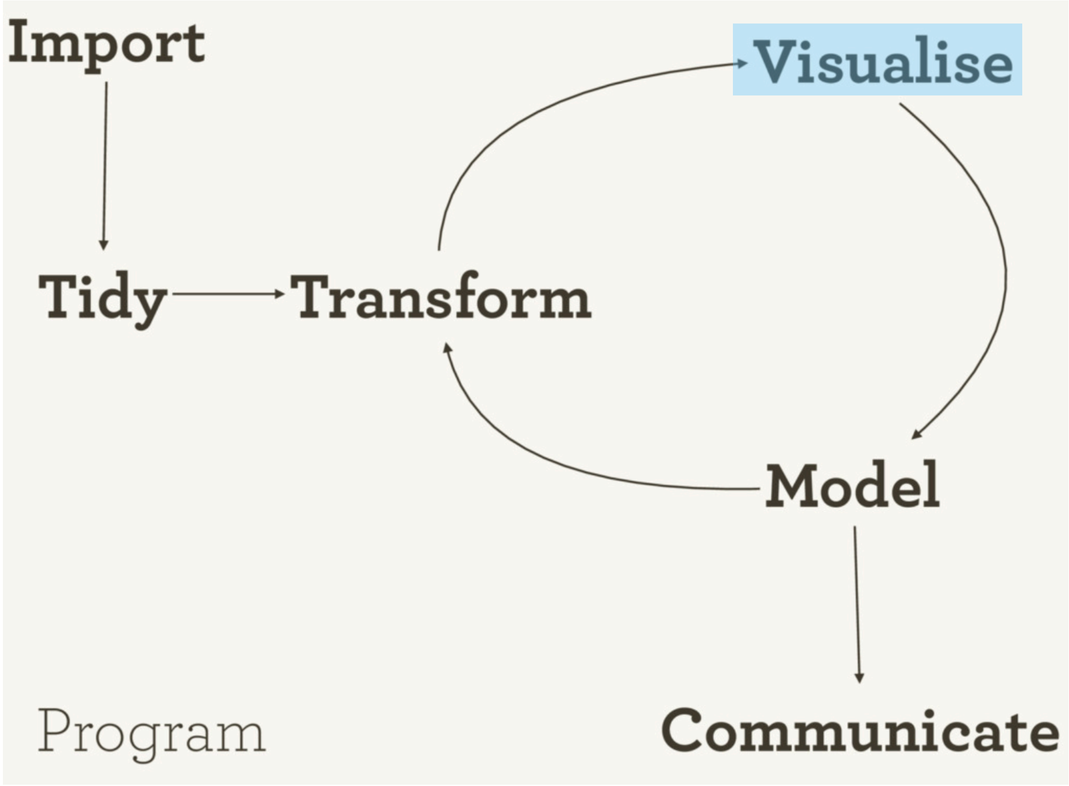
I want students to understand their data

1. Data cleaning and summarizing with dplyr



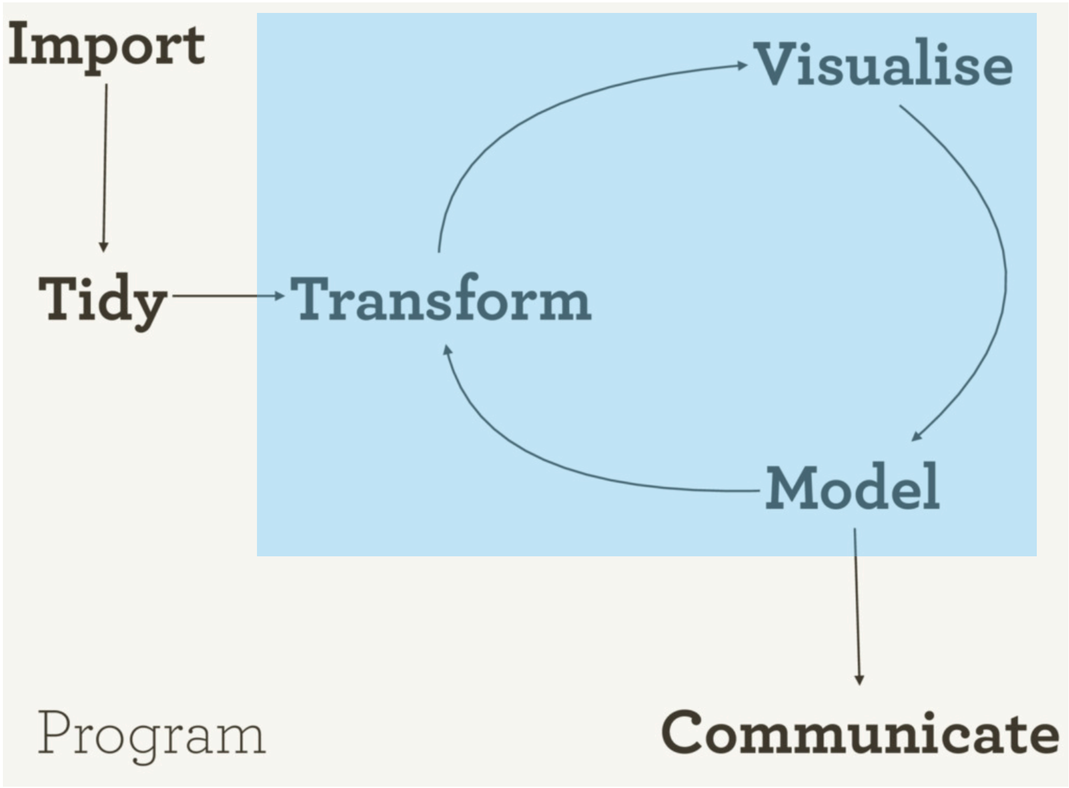
I want students to understand their data

1. Data cleaning and summarizing with dplyr
2. Data visualization with ggplot2



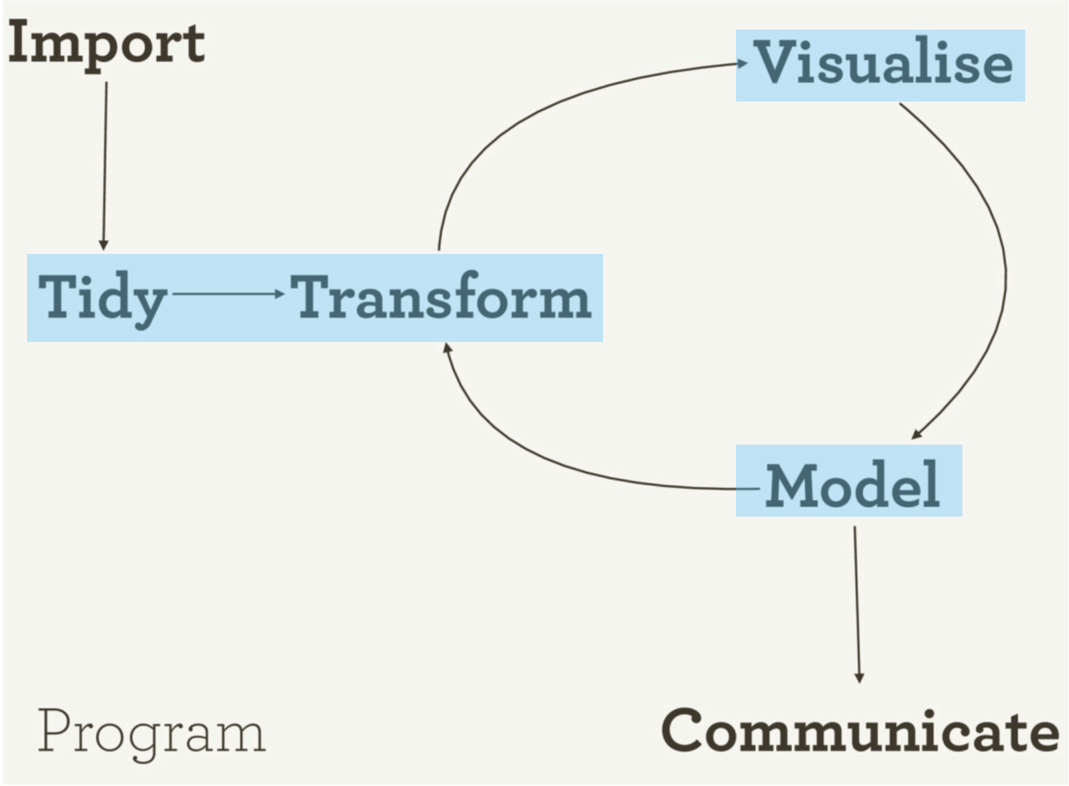
I want students to understand their data

1. Data cleaning and summarizing with dplyr
2. Data visualization with ggplot2
3. Tidy modeling with broom



I want students to understand their data

1. Data cleaning and summarizing with dplyr
2. Data visualization with ggplot2
3. Tidy modeling with broom
4. Joining and tidying

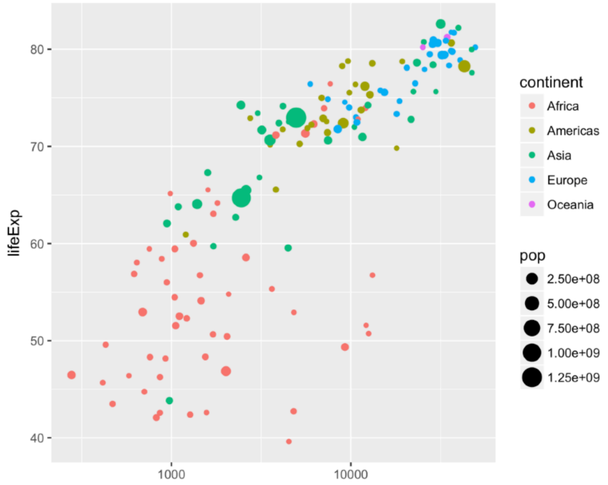


Why is the tidyverse well suited for beginners?

Why is the tidyverse well suited for beginners?

```
gapminder %>%
  mutate(gdp = gdpPercap * pop) %>%
  filter(year == 2007) %>%
  arrange(desc(gdp))
```

```
# A tibble: 142 x 7
          country continent  year lifeExp        pop gdpPercap          gdp
           <fctr>    <fctr> <int>   <dbl>      <dbl>     <dbl>        <dbl>
 1  United States  Americas  2007  78.242  301139947 42951.653 1.293446e+13
 2          China      Asia  2007  72.961 1318683096  4959.115 6.539501e+12
 3          Japan      Asia  2007  82.603  127467972 31656.068 4.035135e+12
 4          India      Asia  2007  64.698 1110396331  2452.210 2.722925e+12
 5        Germany    Europe  2007  79.406   82400996 32170.374 2.650871e+12
 6 United Kingdom    Europe  2007  79.425   60776238 33203.261 2.017969e+12
 7         France    Europe  2007  80.657   61083916 30470.017 1.861228e+12
 8         Brazil  Americas  2007  72.390  190010647  9065.801 1.722599e+12
 9          Italy    Europe  2007  80.546   58147733 28569.720 1.661264e+12
10         Mexico  Americas  2007  76.195  108700891 11977.575 1.301973e+12
# ... with 132 more rows
```

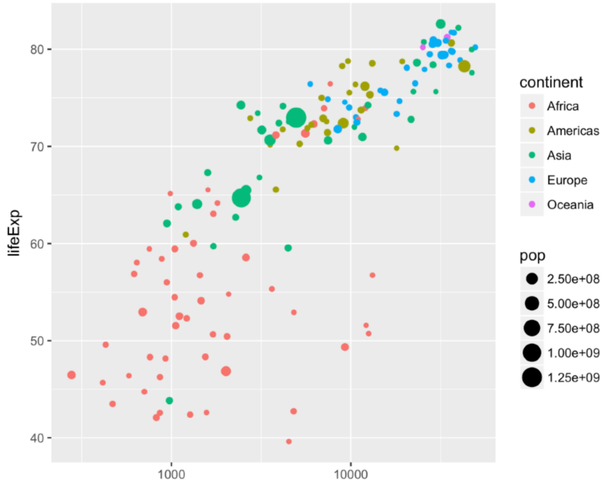


Powerful

Why is the tidyverse well suited for beginners?

```
gapminder %>%
  mutate(gdp = gdpPercap * pop) %>%
  filter(year == 2007) %>%
  arrange(desc(gdp))
```

```
# A tibble: 142 x 7
          country continent  year lifeExp        pop gdpPercap          gdp
           <fctr>    <fctr> <int>   <dbl>      <dbl>     <dbl>        <dbl>
 1  United States  Americas  2007  78.242  301139947 42951.653 1.293446e+13
 2          China      Asia  2007  72.961 1318683096  4959.115 6.539501e+12
 3          Japan      Asia  2007  82.603  127467972 31656.068 4.035135e+12
 4          India      Asia  2007  64.698 1110396331  2452.210 2.722925e+12
 5        Germany    Europe  2007  79.406   82400996 32170.374 2.650871e+12
 6 United Kingdom    Europe  2007  79.425   60776238 33203.261 2.017969e+12
 7         France    Europe  2007  80.657   61083916 30470.017 1.861228e+12
 8         Brazil  Americas  2007  72.390  190010647  9065.801 1.722599e+12
 9          Italy    Europe  2007  80.546   58147733 28569.720 1.661264e+12
10         Mexico  Americas  2007  76.195  108700891 11977.575 1.301973e+12
# ... with 132 more rows
```



Powerful

Consistent

fs package

Naming convention. **fs** functions use a consistent naming convention. Because base R's functions were gradually added over time there are a number of different conventions used (e.g. `path.expand()` vs `normalizePath()` ; `Sys.chmod()` vs `file.access()`).

What is left until later?

What is left until later?

Data Structures

```
factor(c("a", "b"), levels = c("b", "a"))

matrix(1:12, nrow = 3)

list(b = 2, c = 8)
```

What is left until later?

Data Structures

```r
factor(c("a", "b"), levels = c("b", "a"))

matrix(1:12, nrow = 3)

list(b = 2, c = 8)
```

Loops

```r
for (x in 1:10) {
  y <- x + 2
  print(y)
}
```

What is left until later?

Data Structures

```r
factor(c("a", "b"), levels = c("b", "a"))

matrix(1:12, nrow = 3)

list(b = 2, c = 8)
```

Loops

```r
for (x in 1:10) {
  y <- x + 2
  print(y)
}
```

Conditionals

```r
x <- 2
if (x > 4) {
  print("x is greater than 4")
} else {
  print("x is not greater than 4")
}
```

What is left until later?

Data Structures

```r
factor(c("a", "b"), levels = c("b", "a"))

matrix(1:12, nrow = 3)

list(b = 2, c = 8)
```

Loops

```r
for (x in 1:10) {
  y <- x + 2
  print(y)
}
```

Conditionals

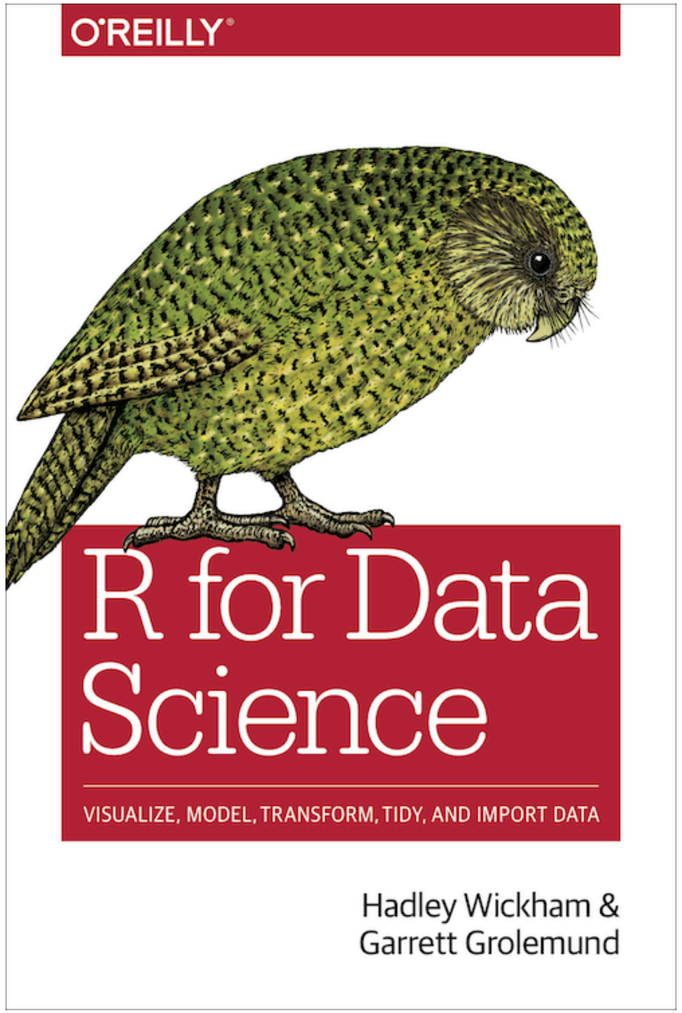
```r
x <- 2
if (x > 4) {
  print("x is greater than 4")
} else {
  print("x is not greater than 4")
}
```

User-defined functions

```r
add_three <- function(x) {
  x + 3
}

add_three(8)
```

What is left until later?



R for Data Science

What is left until later?

1 Introduction

I Explore

2 Introduction

3 Data visualisation

4 Workflow: basics

5 Data transformation

6 Workflow: scripts

7 Exploratory Data Analysis

8 Workflow: projects

II Wrangle

9 Introduction

10 Tibbles

11 Data import

12 Tidy data

13 Relational data

14 Strings

15 Factors

16 Dates and times

III Program

17 Introduction

18 Pipes

19 Functions

20 Vectors

21 Iteration

IV Model

22 Introduction

23 Model basics

24 Model building

25 Many models

V Communicate

26 Introduction

27 R Markdown

28 Graphics for communication

29 R Markdown formats

30 R Markdown workflow

R for Data Science

What is left until later?

R for Data Science

What is left until later?

R for Data Science


Wax on, wax off.


Wax on, wax off.

```r
x <- 1:10

for (item in x) {
  print(x)
}
```

```r
x <- 1:10

for (item in x) {
  print(x)
}
```

```r
s <- numeric(length(x) + 1)
for (i in seq_along(s)) {
  if (i == 1) {
    s[i] <- x[i]
  } else {
    s[i] <- alpha * x[i] + (1 - alpha) * s[i - 1]
  }
}
```

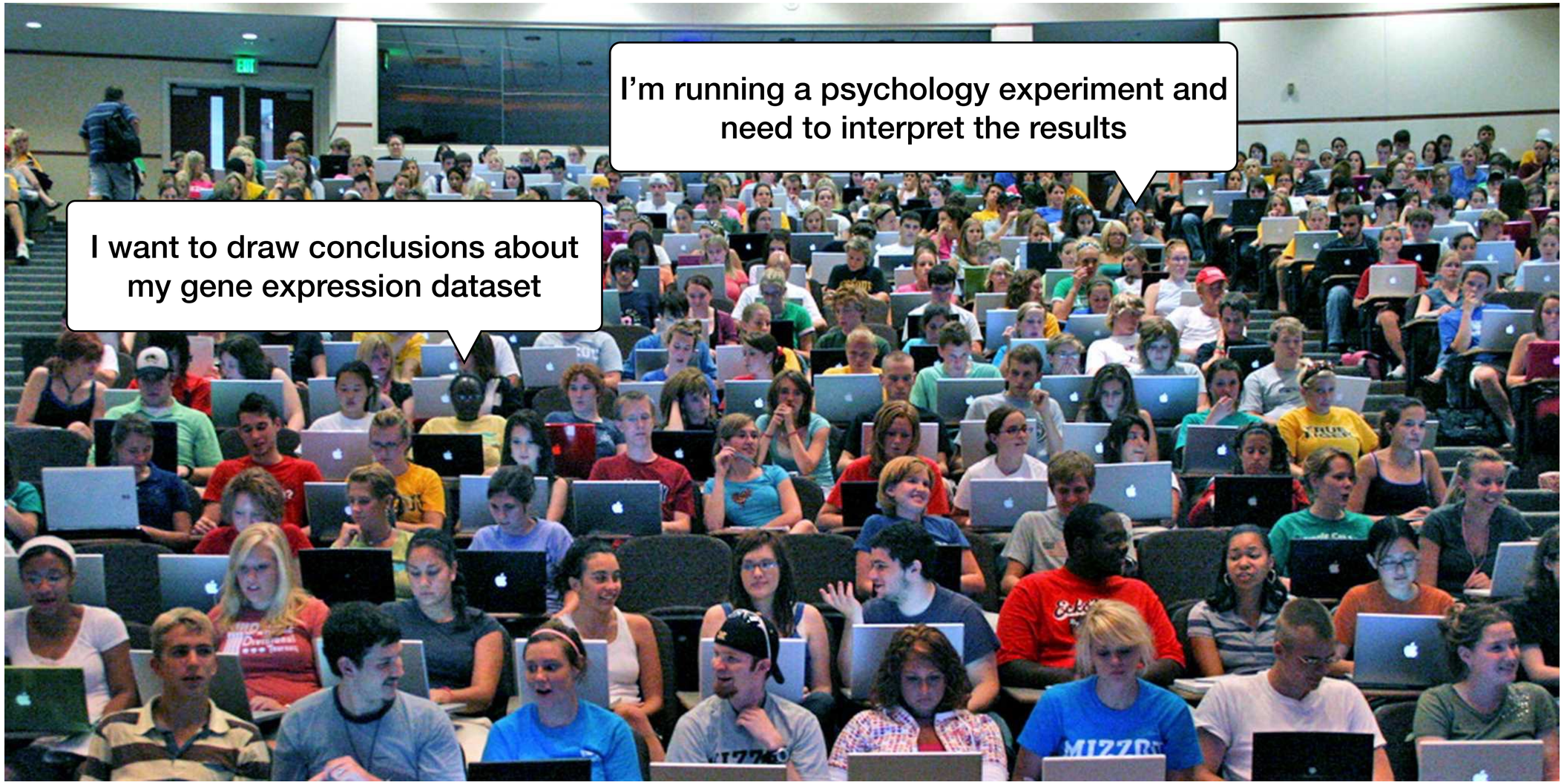
Have goals for what you want your students to do,
and start them doing it as early as possible.

Have goals for what you want your students to do,
and start them doing it as early as possible.

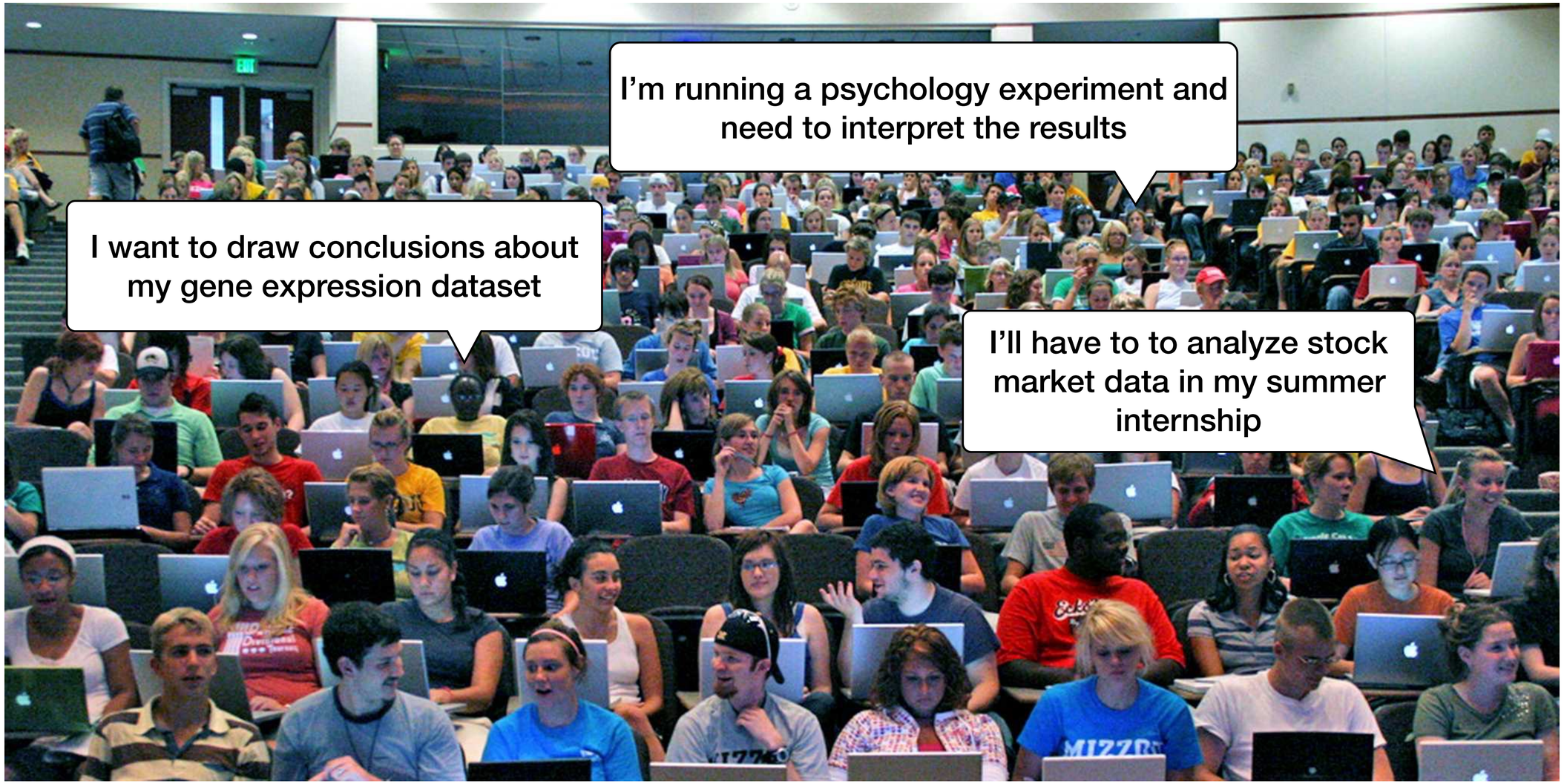
What do beginners want to learn?

What do beginners want to learn?

What do beginners want to learn?



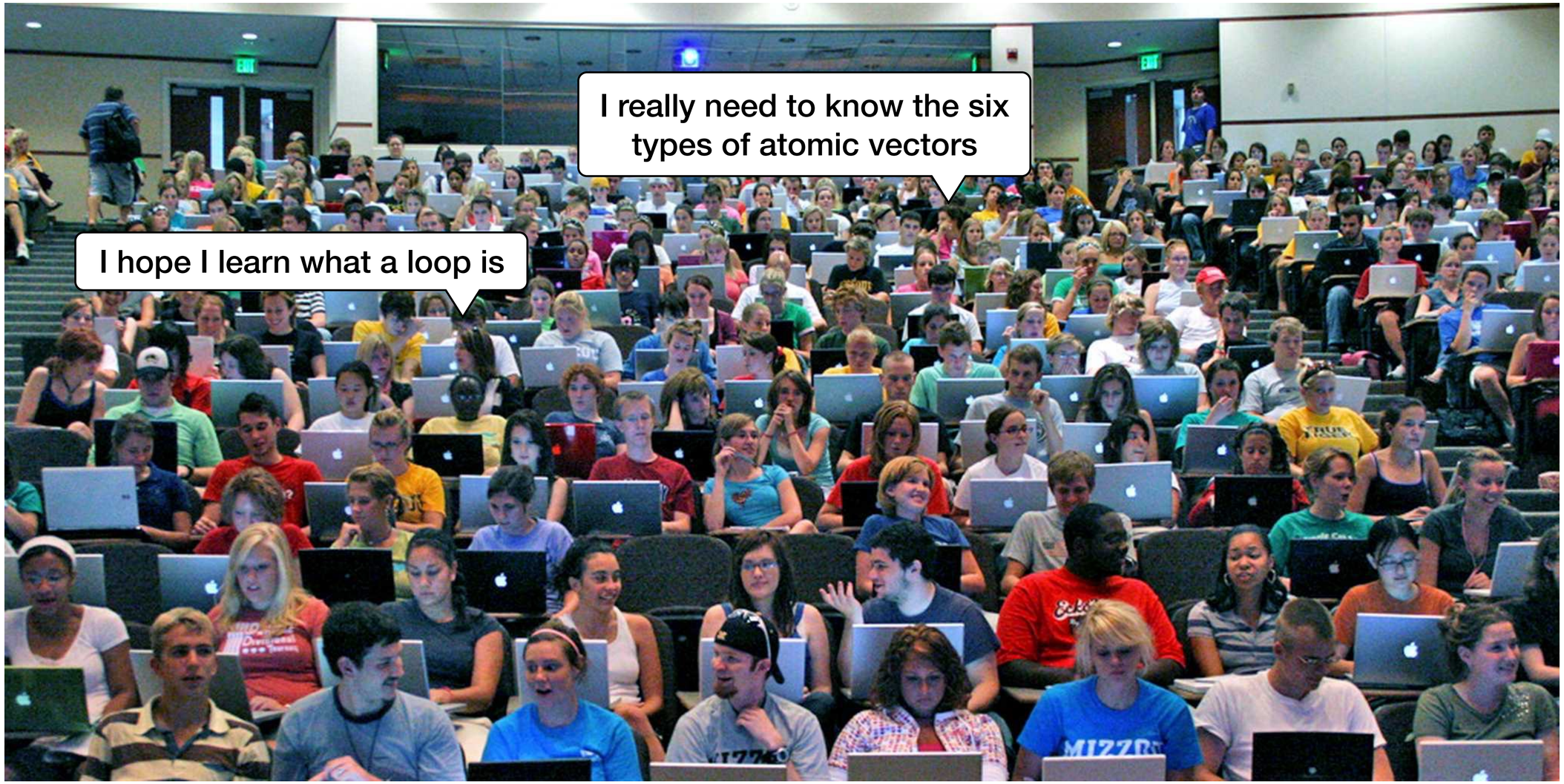
What do beginners want to learn?



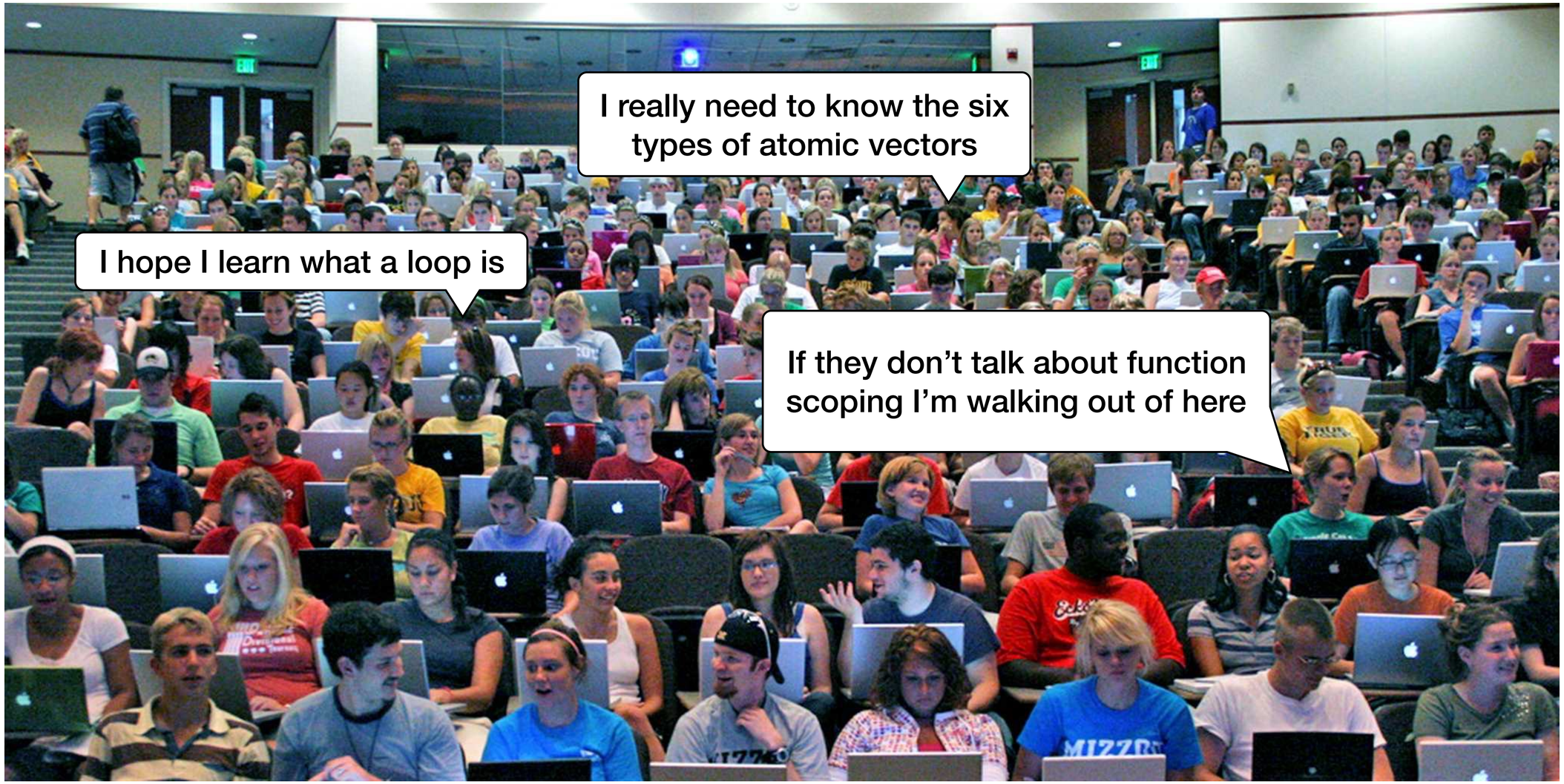
What do beginners want to learn?

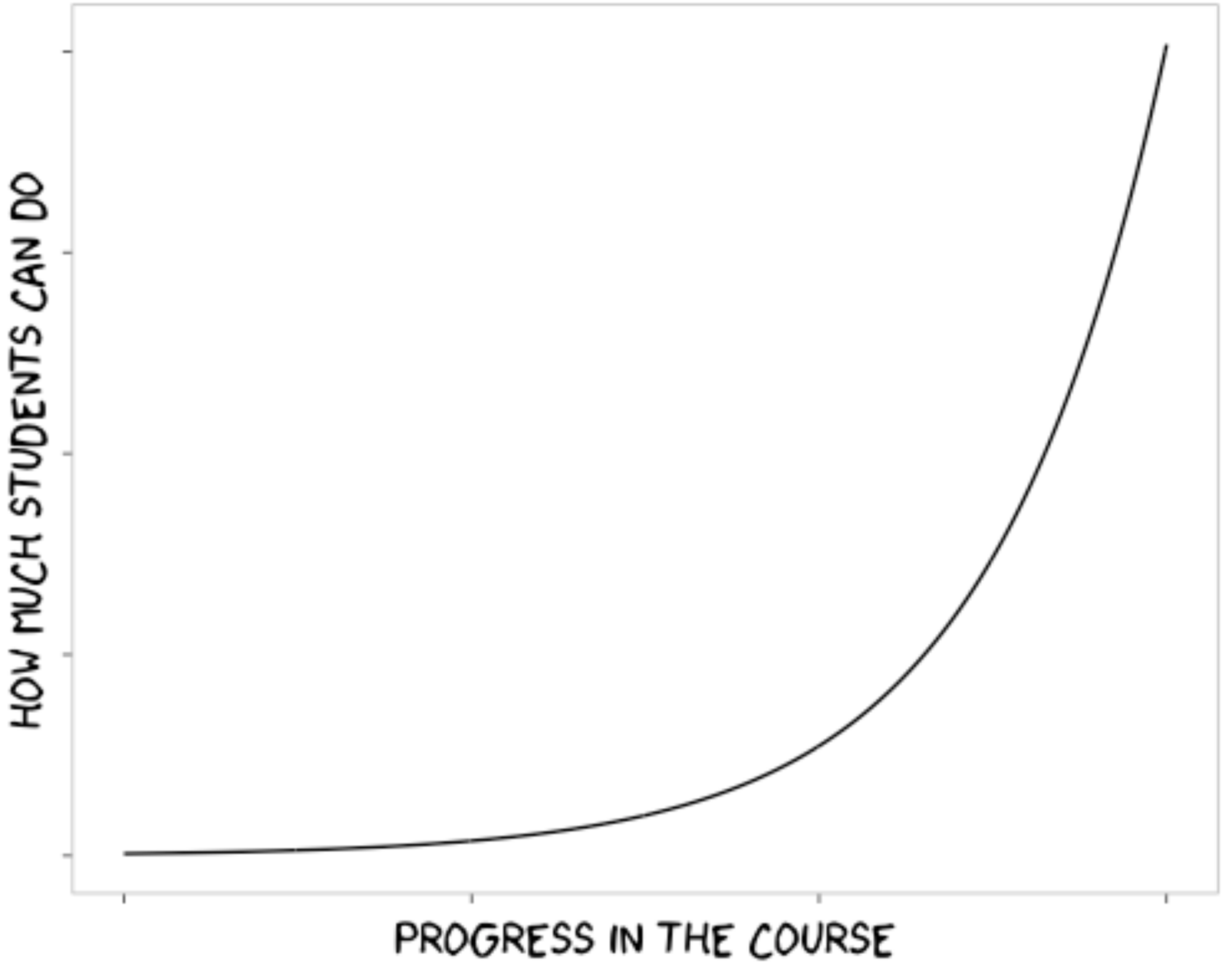
What do beginners want to learn?

What do beginners want to learn?

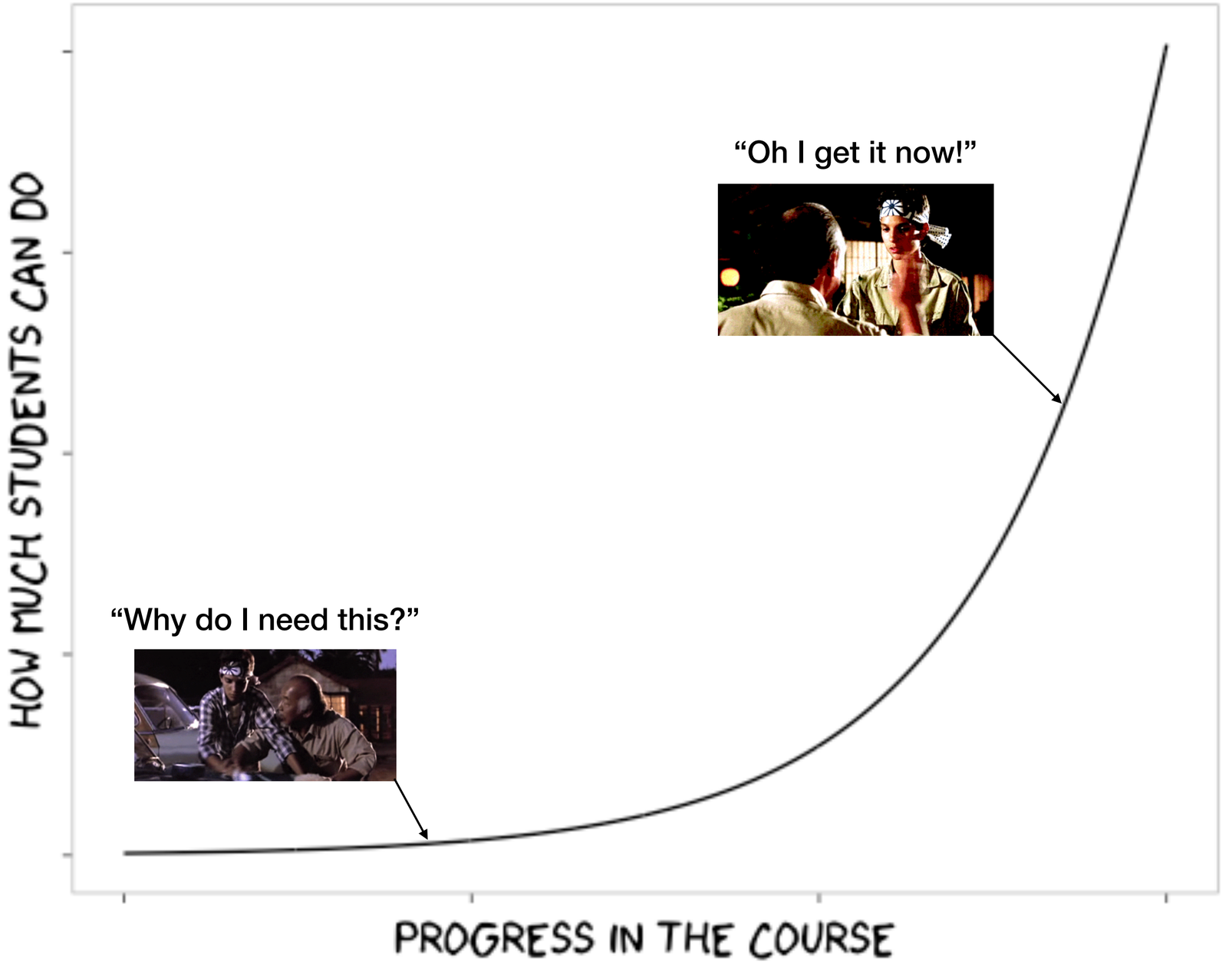


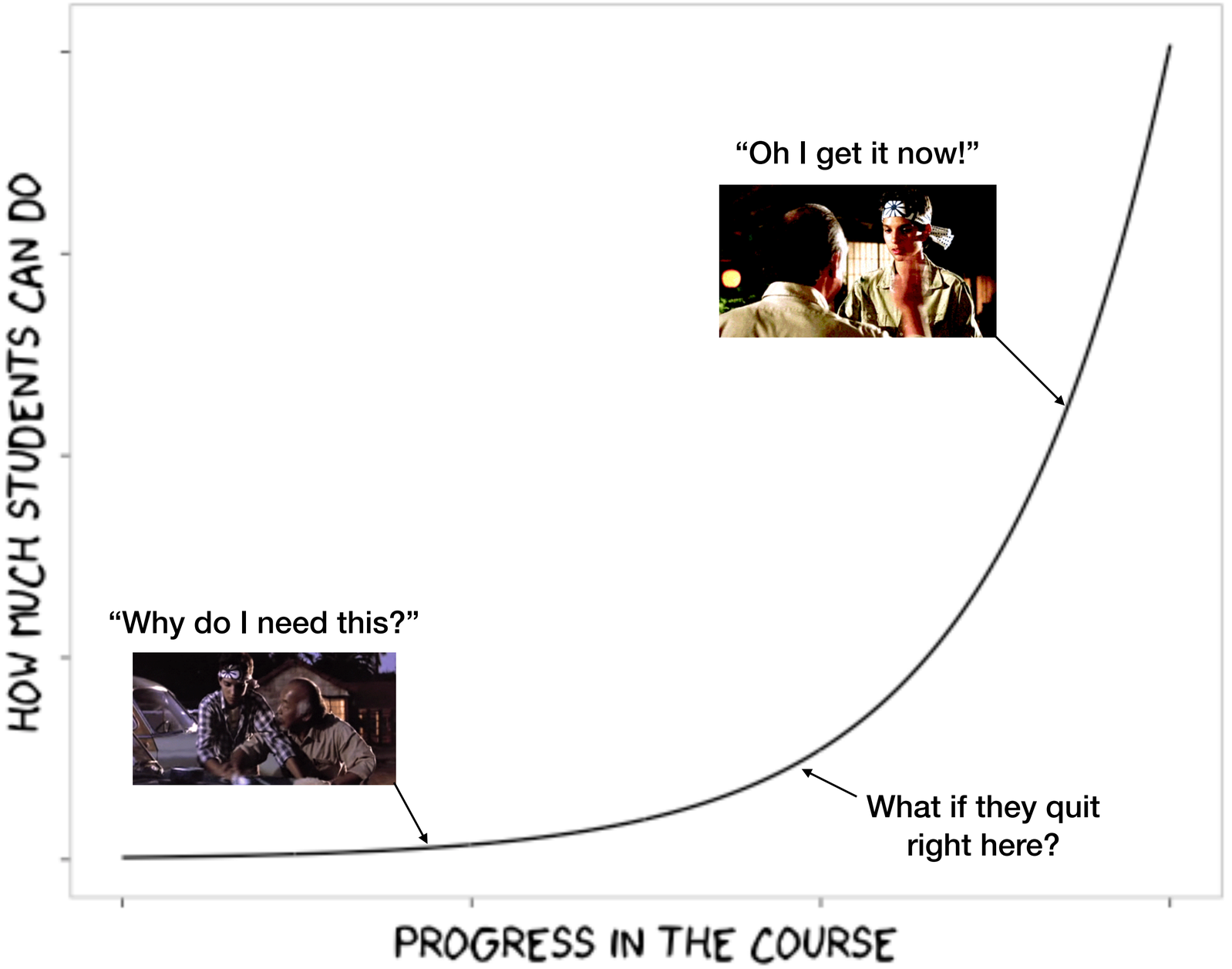
What do beginners want to learn?

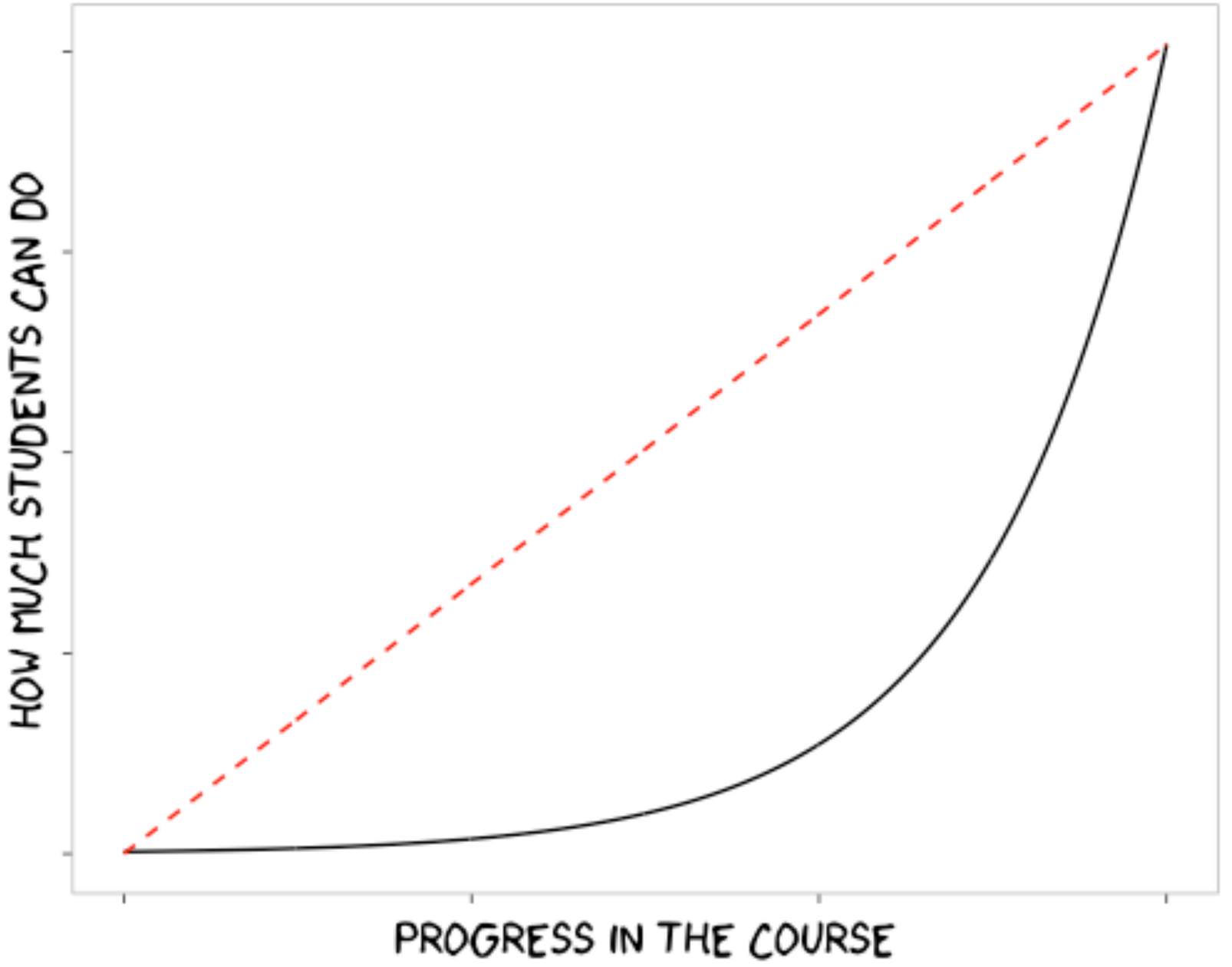


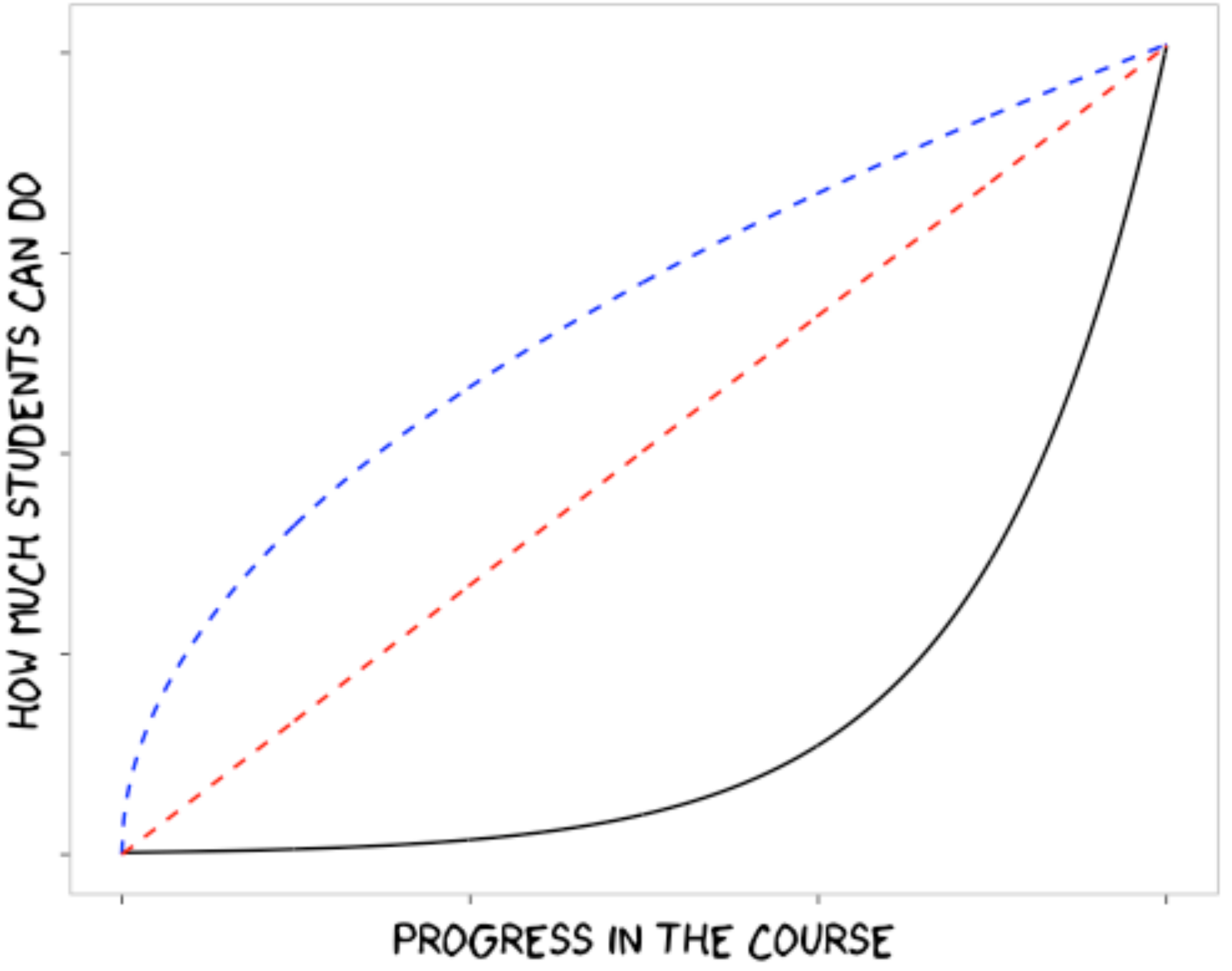

HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE


HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE
“Why do I need this?”


HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE
"Why do I need this?"
"Oh I get it now!"

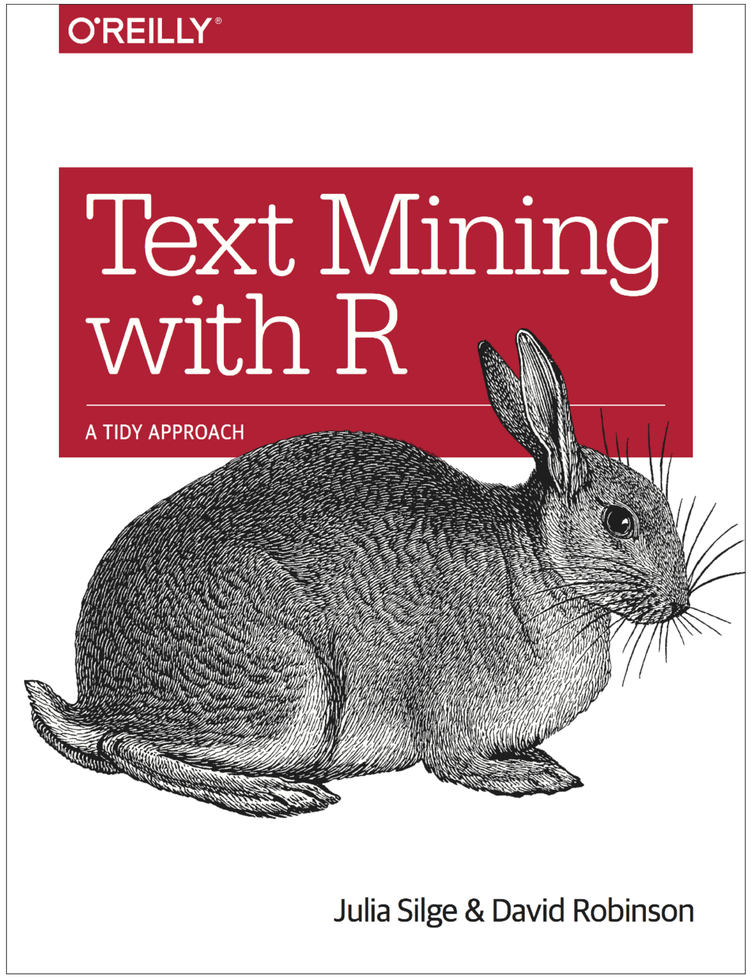

HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE
"Why do I need this?"
"Oh I get it now!"
What if they quit right here?


HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE

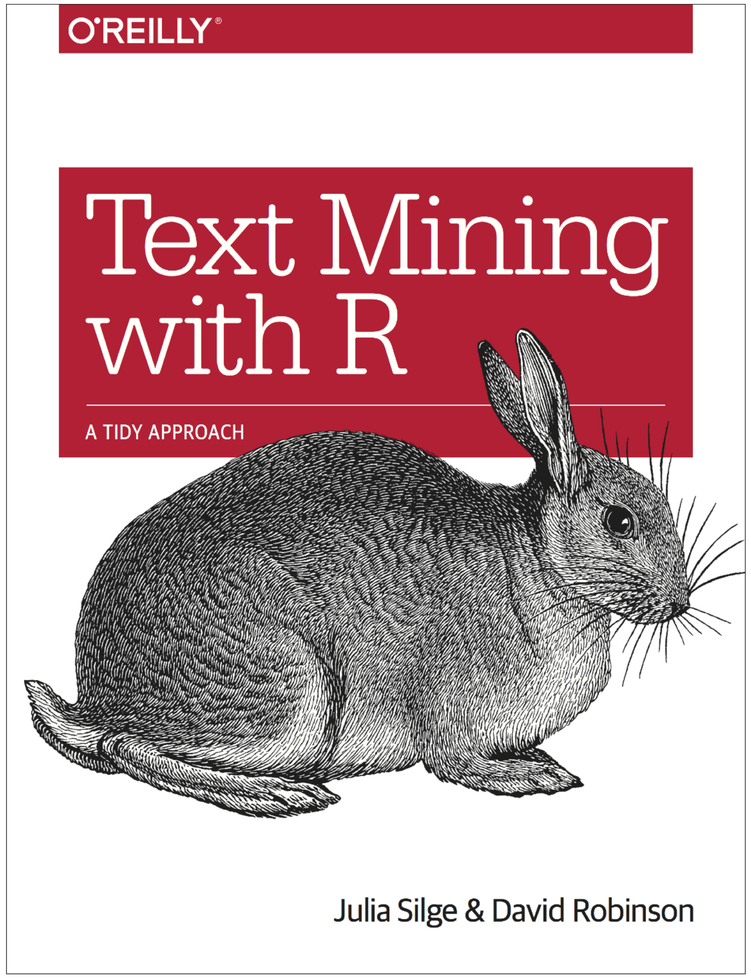

HOW MUCH STUDENTS CAN DO
PROGRESS IN THE COURSE

“Students won’t get very far with just the tidyverse”

“Students won’t get very far with just the tidyverse”



“Students won’t get very far with just the tidyverse”



Not a single loop or conditional

When *shouldn't* you teach the tidyverse first?

Have goals for what you want your students to do,
and start them doing it as early as possible.

Have goals for what you want your students to do,
and start them doing it as early as possible.

What goals could students have besides understanding data?

Programming

What goals could students have besides understanding data?

Programming

What goals could students have besides understanding data?

Programming

- Why choose R?

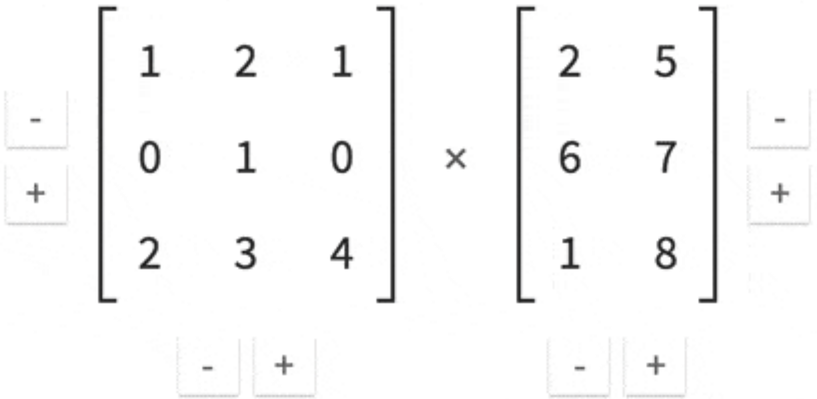
What goals could students have besides understanding data?

Programming

- Why choose R?
- Are students as interested in writing packages as you think?

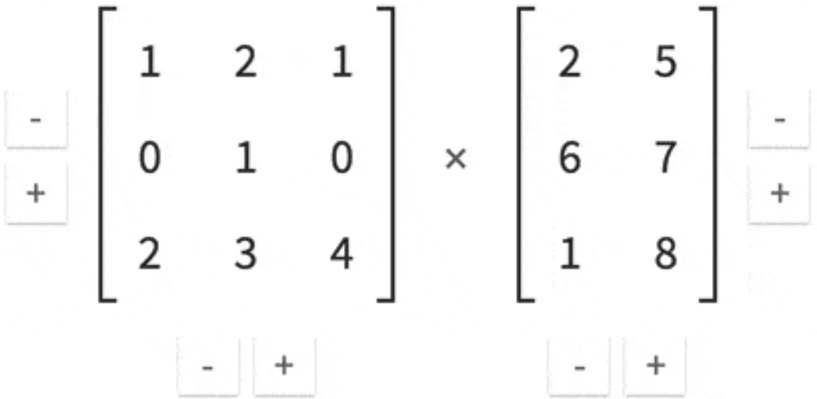
What goals could students have besides understanding data?

Mathematics

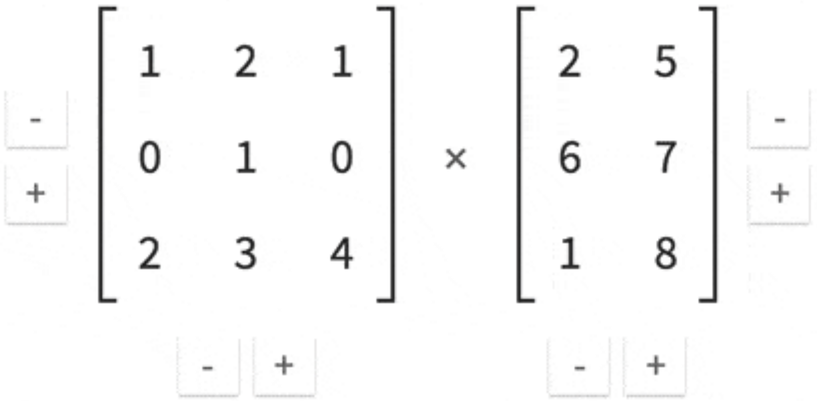


What goals could students have besides understanding data?

Mathematics



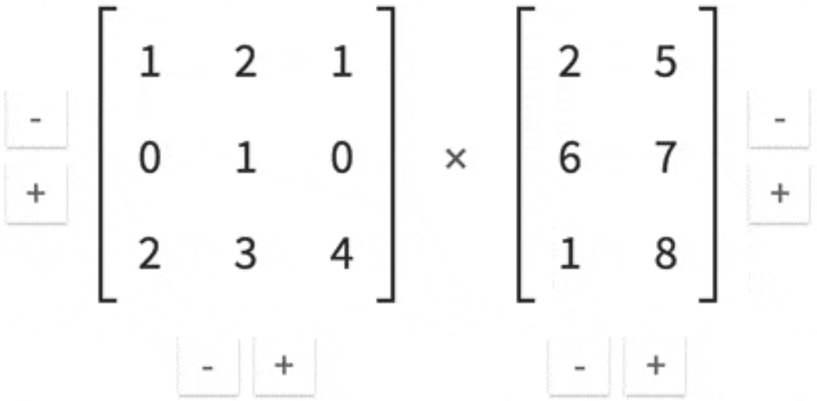
What goals could students have besides understanding data?



Mathematics

- Teach matrices before data frames

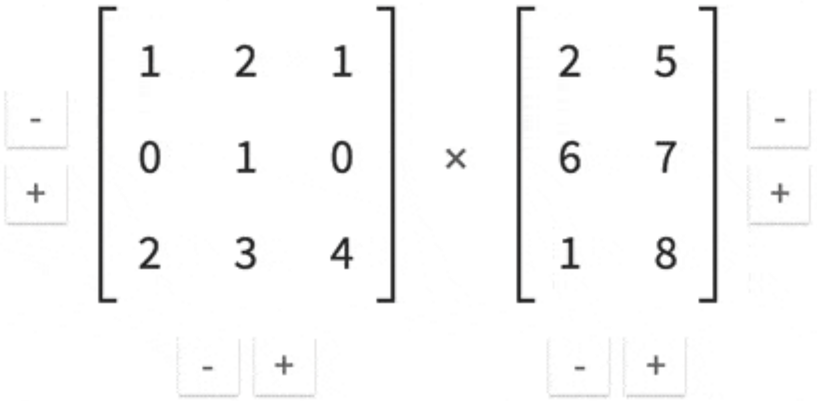
What goals could students have besides understanding data?



Mathematics

- Teach matrices before data frames
- Teach linear algebra before relational algebra (SQL)

What goals could students have besides understanding data?



Mathematics

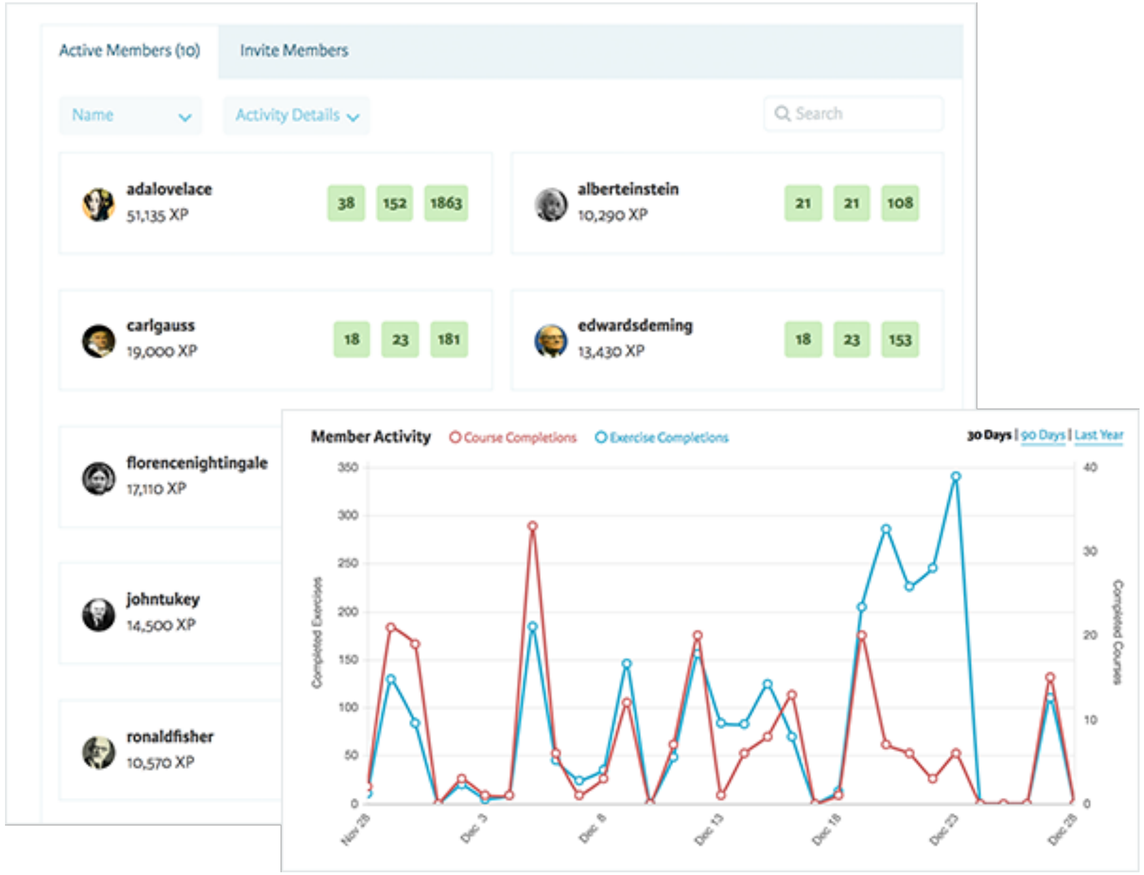
- Teach matrices before data frames
- Teach linear algebra before relational algebra (SQL)
- Teach the abstract before the concrete

What's next?

What's next?

Data-driven curriculum development

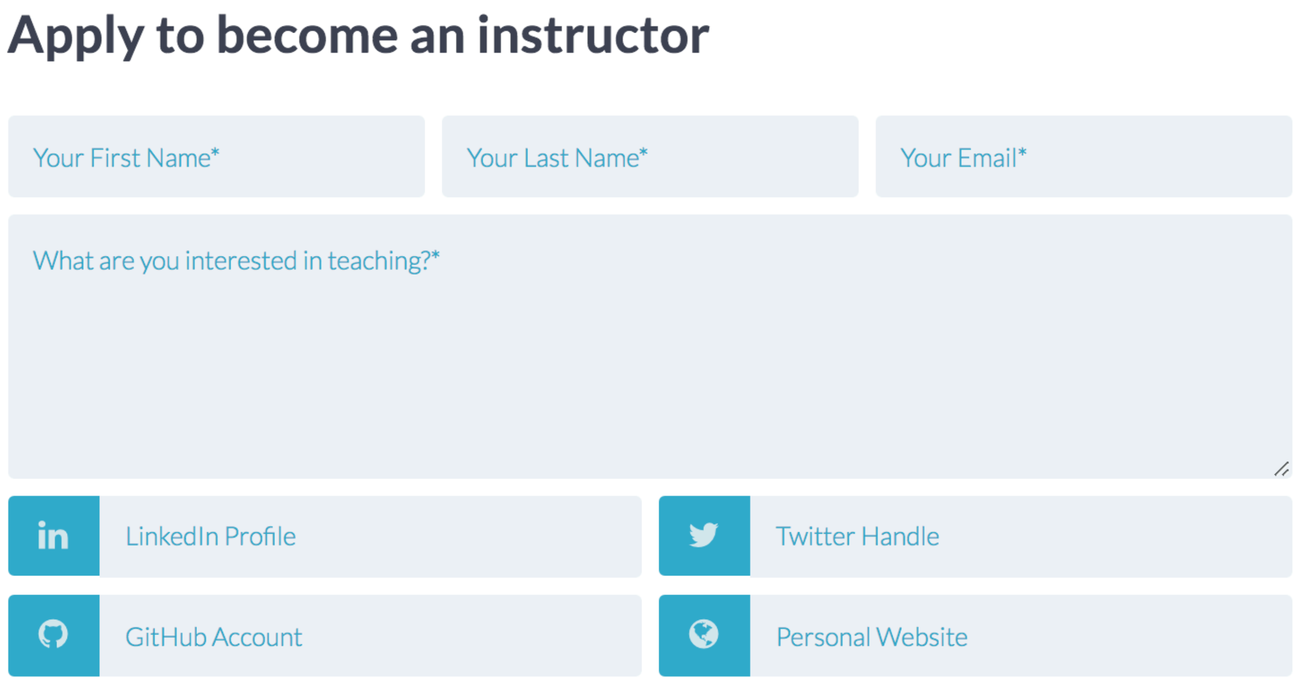
Want your team to learn the tidyverse?



DataCamp for Business

Want to teach data science to a huge audience?

datacamp.com/create



Thank you

DataCamp

@drob

www.varianceexplained.org

- RStudio
  - Hadley Wickham
  - Joe Cheng
  - Garrett Grolemund
  - Anne Carome
- Julia Silge
- Chester Ismay