

# CSC 8631 - EDA Report

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## Abstract

This document provides an analysis of massive open online certificate (MOOC) learning data through Newcastle University. And along with it shows the benefits of reproducible data science using r markdown. The data set contains 52 .csv files, of which three files have been used for performing analysis. The analysis performed is a freehand analysis of the data set with the liberty to generate our own questions and find their answers.

*keywords:* MOOC data set, Data Analysis, reproducibility

## Introduction

With the advent of the internet, online education adoption has been a much debatable area but nevertheless, it has been rising. The world is now more connected than ever and online education is enabling thousands of individuals who aspire to study world-class education and all that at the comfort of their homes with flexible times. Thus virtually removing the barriers of inaccessible education and promoting free and fair resource sharing.

Due to the unfortunate impact of the covid-19 pandemic in 2020, there has been a significant increase in the use of online education platforms also called massive open online certificates or MOOCs. The dataset contains of 52 .csv files, of which 3 files have been chosen for performing data analysis and the results are presented in this report.

## Data Set information

The first data set comprises of enrollment information, had several unknown values and had to be cleaned to generate a clean sample from a population. Below is the overview of the enrollment data.

```
## # A tibble: 6 x 13
##   learner_id enrolled_at unenrolled_at role fully_participa~ purchased_state~
##   <chr>      <chr>      <chr>      <chr> <chr>      <chr>
## 1 4dc22fed-6~ 2016-05-24 ~ "2018-10-30 ~ lear~ ""
## 2 7a44b170-7~ 2016-05-19 ~ "2018-10-16 ~ lear~ "2016-10-06 04:~ ""
## 3 3fc06ecd-3~ 2016-09-05 ~ "2018-10-12 ~ lear~ ""
## 4 51c61184-8~ 2016-05-18 ~ "2018-09-23 ~ lear~ ""
## 5 e7dc43d0-a~ 2016-09-05 ~ ""          lear~ ""
## 6 d8d3f0a0-9~ 2016-09-04 ~ ""          lear~ ""
## # ... with 7 more variables: gender <chr>, country <chr>, age_range <chr>,
## #   highest_education_level <chr>, employment_status <chr>,
## #   employment_area <chr>, detected_country <chr>
```

This data set contains data for the video statistics. It can be useful to get deep insight on how the enrolled students are utilizing the online courses.

```
## $step_position
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      1.100   1.190   2.110   2.113   3.100   3.200
##
## $title
##      Length      Class      Mode
##      13 character character
##
## $video_duration
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      37      99      241      231      313      426
##
## $total_views
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      446      484      680      739      755      1659
##
## $total_downloads
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      34.00  42.00  50.00  58.15  63.00  113.00
##
## $total_caption_views
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      1.000   2.000   4.000   6.923   5.000  36.000
##
## $total_transcript_views
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      66.0      87.0  110.0  122.8  147.0  221.0
##
## $viewed_hd
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      4.00      8.00  13.00  50.31  28.00  434.00
##
## $viewed_five_percent
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      70.39  72.85  73.72  74.26  75.48  78.45
##
## $viewed_ten_percent
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      66.31  71.92  73.76  72.95  74.84  75.64
##
## $viewed_twentyfive_percent
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      64.72  69.27  71.92  71.11  73.42  74.93
##
## $viewed_fifty_percent
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      61.52  65.38  69.45  68.48  70.40  73.49
##
## $viewed_seventyfive_percent
##      Min. 1st Qu.  Median      Mean 3rd Qu.      Max.
##      59.57  63.44  66.53  66.64  68.17  73.06
```

```

##
## $viewed_ninetyfive_percent
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   56.38  61.59  62.94   64.25  66.43   72.09
##
## $viewed_onehundred_percent
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   38.57  49.40  57.36   56.34  63.71   69.45
##
## $console_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.0000  0.1300  0.1500  0.1508  0.2100  0.2200
##
## $desktop_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   77.35  79.11  80.32   80.06  80.99   82.29
##
## $mobile_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   6.200  7.020  8.710   8.791  9.850  13.260
##
## $tv_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## 0.000000 0.000000 0.000000 0.004615 0.000000 0.060000
##
## $tablet_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   7.72  10.55  10.95   10.52  11.17   11.91
##
## $unknown_device_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0      0      0      0      0      0
##
## $europe_views_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   55.15  64.90  65.60   64.73  66.25   67.25
##
## $oceania_views_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.240  3.170  3.240   3.265  3.550   4.070
##
## $asia_views_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   8.24   9.11   9.51   10.03   9.92   16.09
##
## $north_america_views_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   10.65  11.21  11.43   11.45  11.67   12.21
##
## $south_america_views_percentage
##   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.650  2.120  2.330   2.424  2.660   3.750
##
## $africa_views_percentage

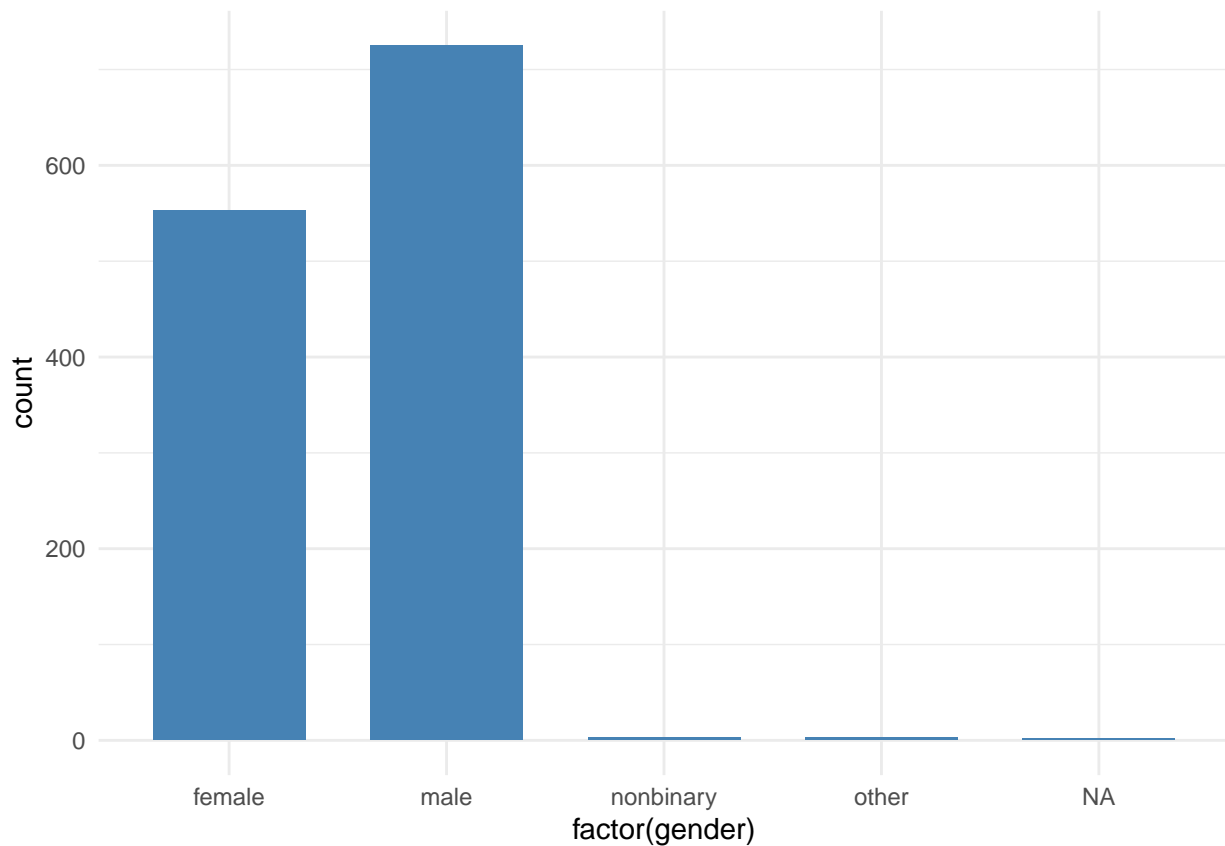
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    5.170  5.560   6.200   6.445  6.380  10.310
##
## $antarctica_views_percentage
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##        0      0      0      0      0      0

## # A tibble: 6 x 10
##   learner_id quiz_question question_type week_number step_number question_number
##   <chr>      <chr>      <chr>      <int>      <int>      <int>
## 1 77454a73~ 1.7.1      MultipleChoi~      1          7          1
## 2 77454a73~ 1.7.1      MultipleChoi~      1          7          1
## 3 a4fa6f89~ 1.7.1      MultipleChoi~      1          7          1
## 4 a4fa6f89~ 1.7.1      MultipleChoi~      1          7          1
## 5 a4fa6f89~ 1.7.1      MultipleChoi~      1          7          1
## 6 f27eec8c~ 1.7.1      MultipleChoi~      1          7          1
## # ... with 4 more variables: response <chr>, cloze_response <lgl>,
## #   submitted_at <chr>, correct <chr>
```

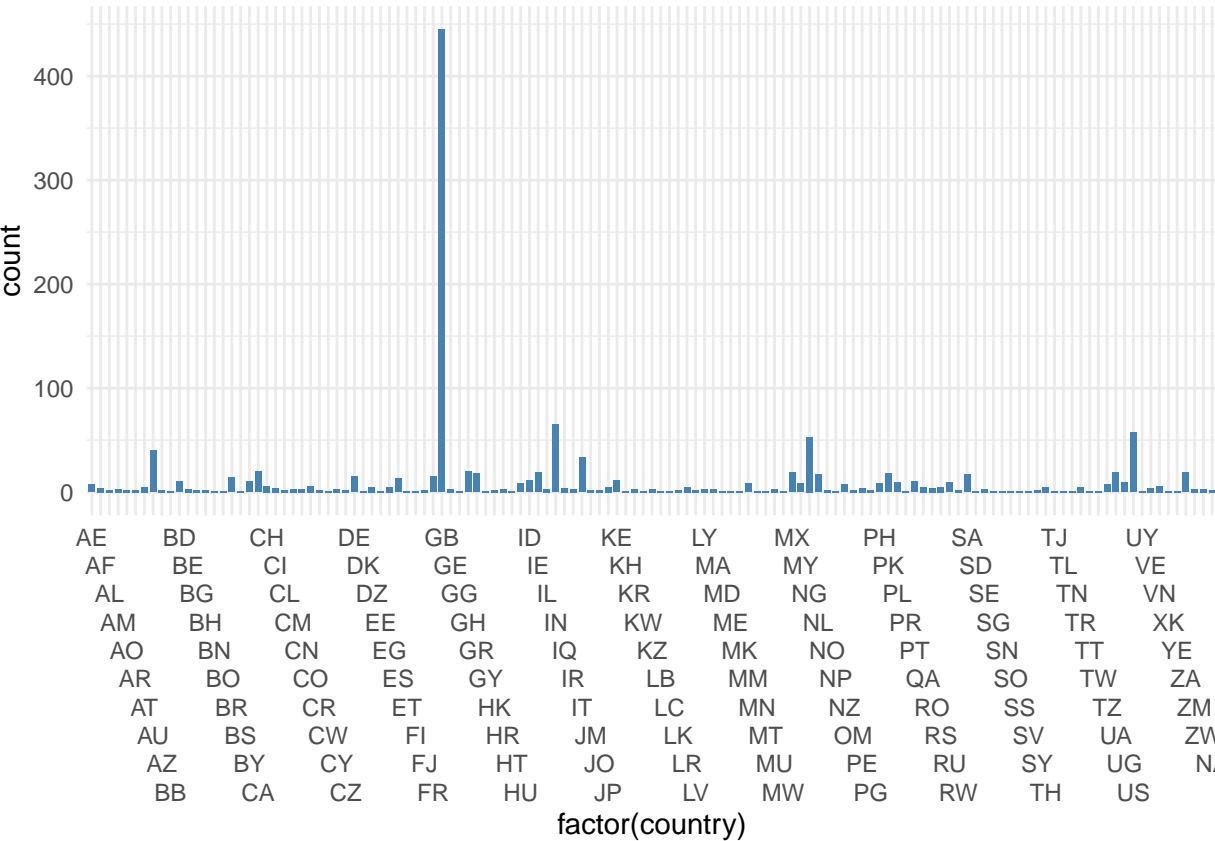
## Data Set 1

**Plot - Gender** In the below plot we are identifying the enrollments based on the gender.

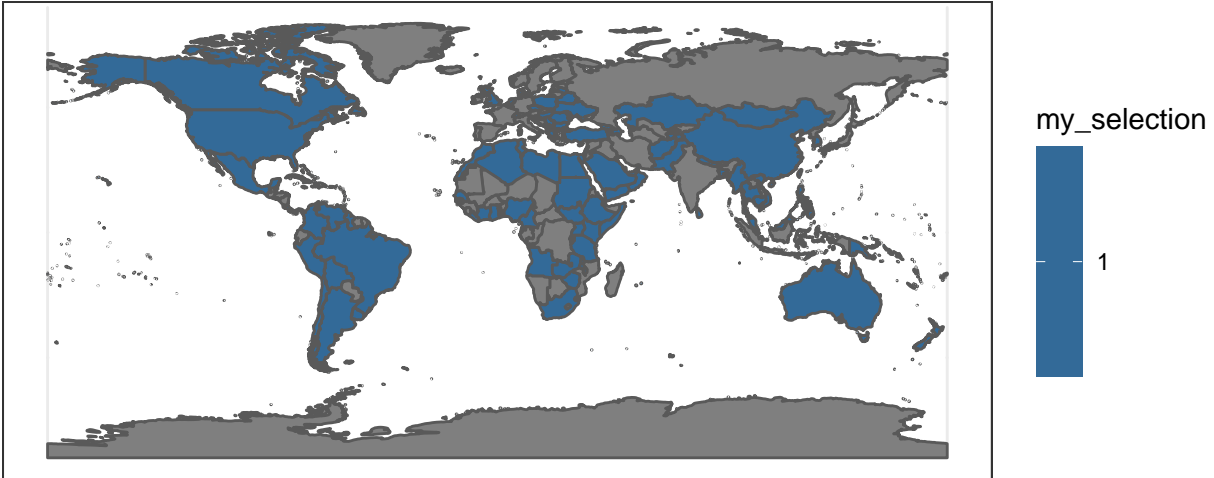


From the graph we can observe that the number of “Males students” enrolled in the course are comparatively more than the “females”.

**Plot - Country** The country plot helps in understanding the demographics of the audience. From the bar plot of the count vs countries we can observe that most number of participants have been from GB (Great Britain).



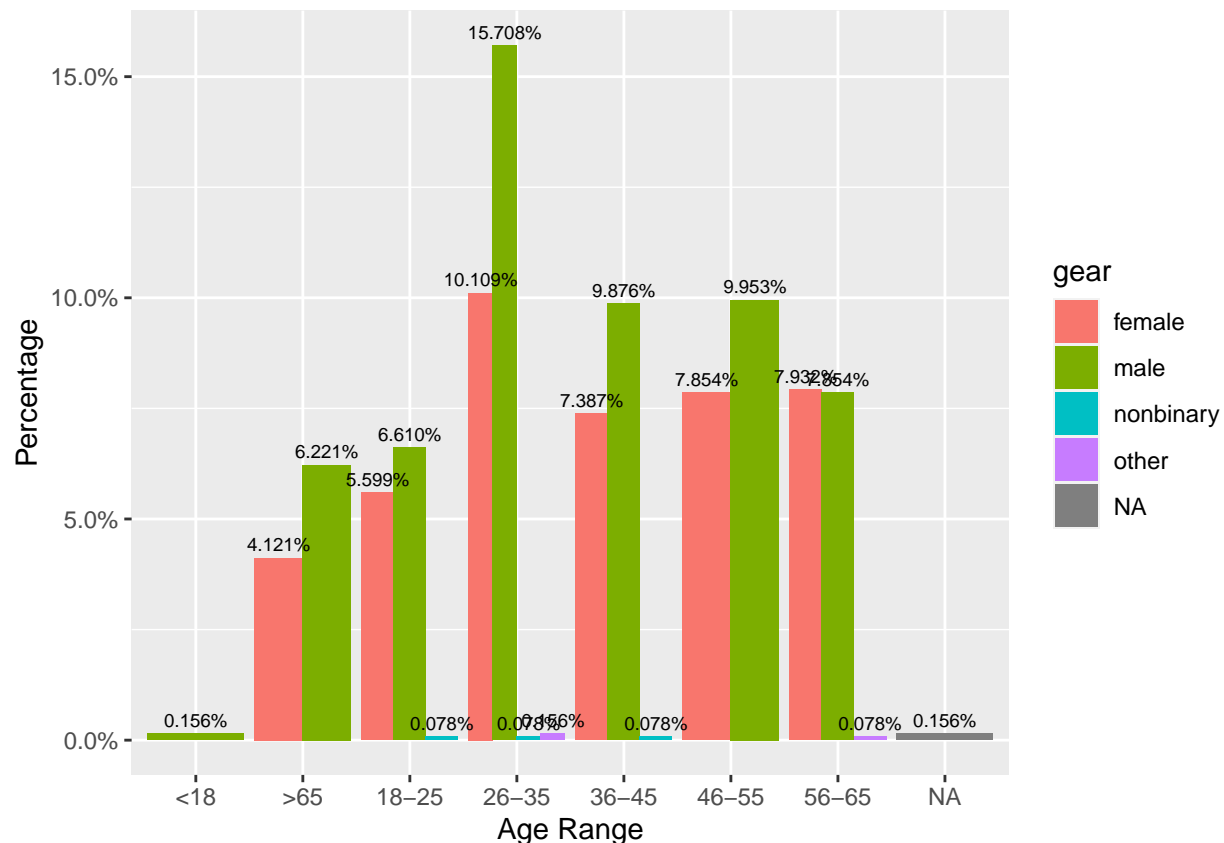
## World map



The map helps us to identify the areas of no coverage. We can see that places from Africa, Middle east & south east countries just above Australia, have little to no engagement with the course moreover surprisingly India with its rich population has zero number of students that have taken this course.

**Plot - Age range vs gender** For identifying various age groups and their respective frequency of engagement with the course we can best customize the course curriculum and teaching methods so as to make better and more interactive course for all the respective age groups. From the plot we can also analyze the trends among various age groups.

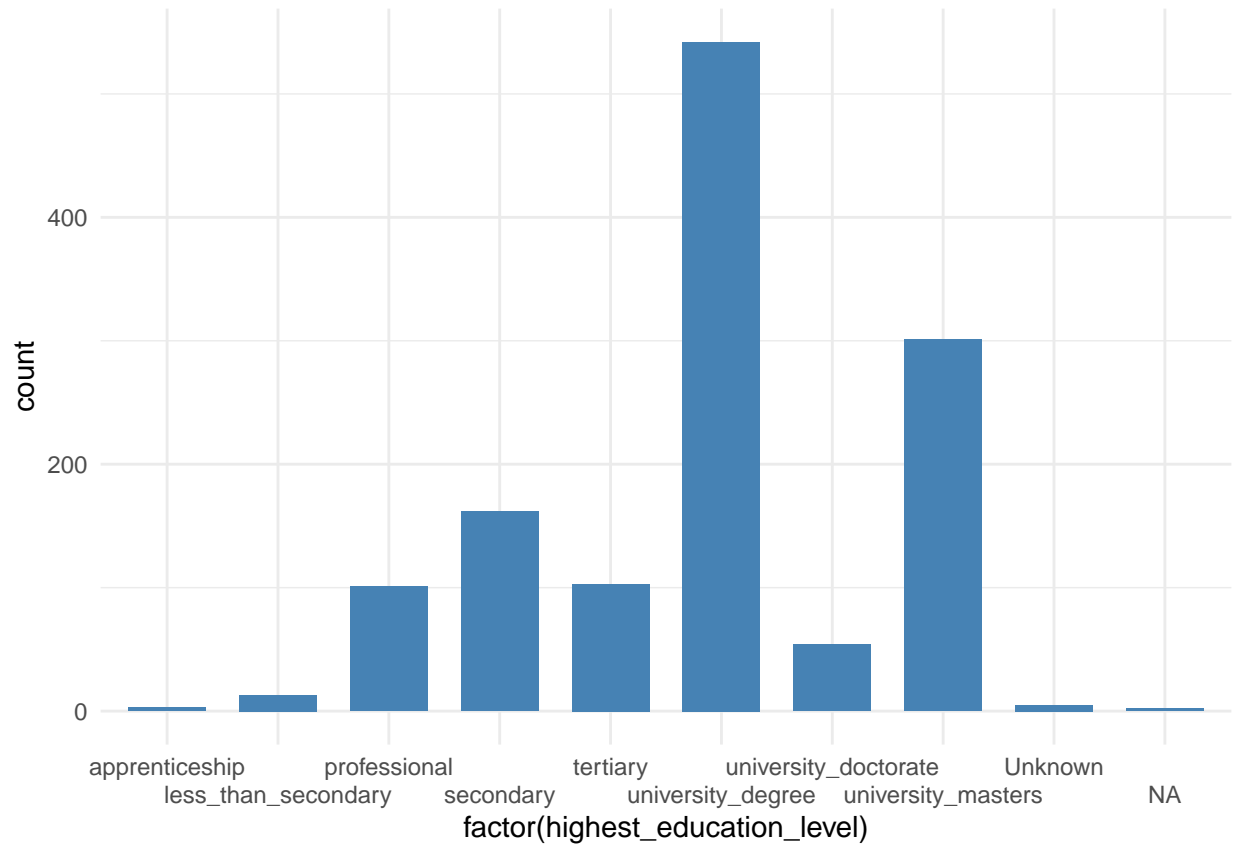
enrol\_age



Plot shows us that the highest number of enrollments have been from youth which are from the age group of 26 - 35. This age group is mostly out of college & typically requires a lot of skill development for filling up proper job skills. Males (15.7%) are the highest enrollments for this age group which may imply greater need of skill development because of much more competition. However, it is exciting to see middle age ranging from 36-45 (9.8%) & 46-55 (9.9%) in significant numbers with male to female ratio (1.3% & 1.2% for respective age ranges) relatively same as compared to age range 26-35(1.5).

**Education level/ Employment plot** The data is useful in understanding the job status and curate the curriculum in a way to up skill the learners.

employment\_plot

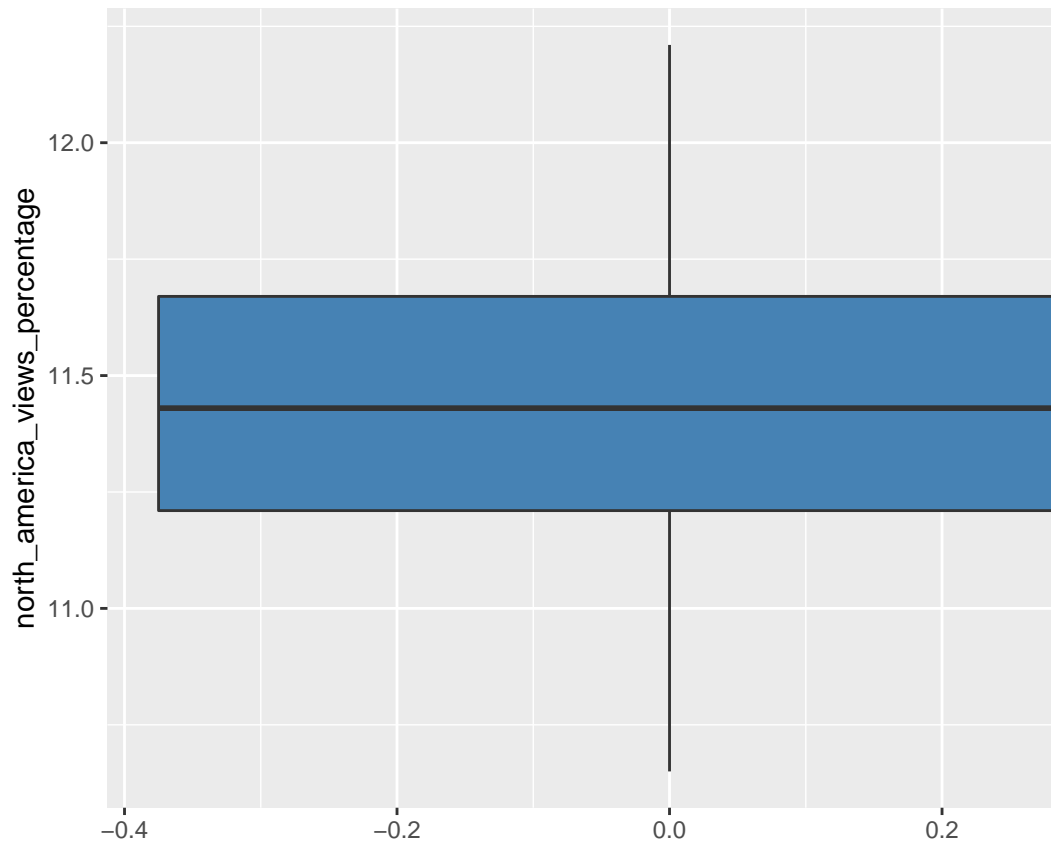


From the above plot we can observe that the full time working population have been the most attracted to this course which intern suggests high demand for skill improvement in professional environment. They can obtain new & desired professional skills while being employed full time, as it helps to fund their education thereby maximizing their results.

## Dataset 2

box\_plot





### Box Plot - Videowatch time

The above boxplot represents the statistical summary for the video watch time for students in North America. from above graph we can infer that the median is about 11.43, mean about 11.45. The above statistics can also be obtained via `summary` function like below.

North America views percentage summary

```
summary(video_stats$north_america_views_percentage)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    10.65  11.21   11.43   11.45  11.67   12.21
```

Asia views percentage summary

```
summary(video_stats$asia_views_percentage)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     8.24   9.11   9.51   10.03   9.92   16.09
```

Europe views percentage summary

```
summary(video_stats$europe_views_percentage)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    55.15  64.90  65.60  64.73  66.25  67.25
```

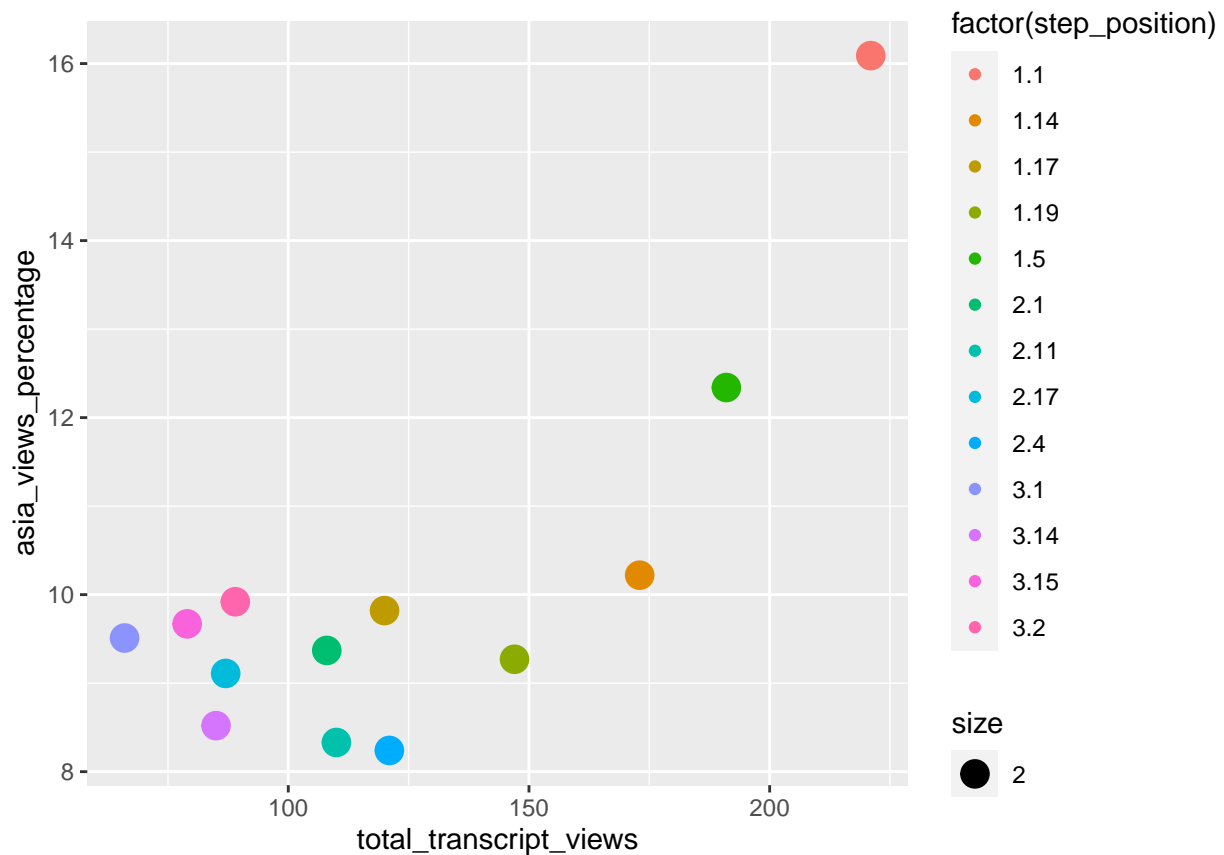
## Oceania view percentage summary

```
summary(video_stats$oceania_views_percentage)
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  2.240  3.170   3.240   3.265   3.550   4.070
```

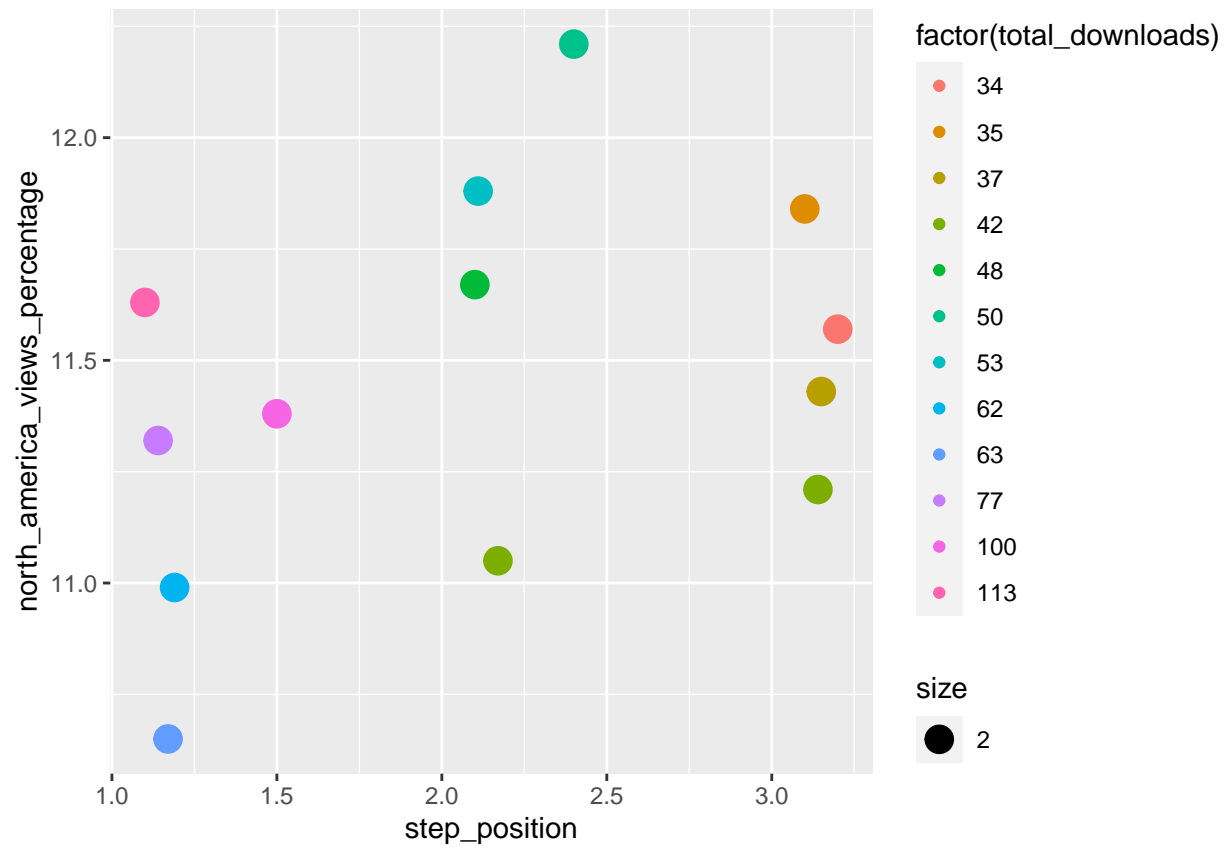
The boxplot presents the statistical five number summary information visually and is a better alternative to quickly identify the mean value and dispersion in data, through above summary we can observe precise numerical values of each of the statistical perimeters used in box plot for the respective countries.

```
asia_transcript
```



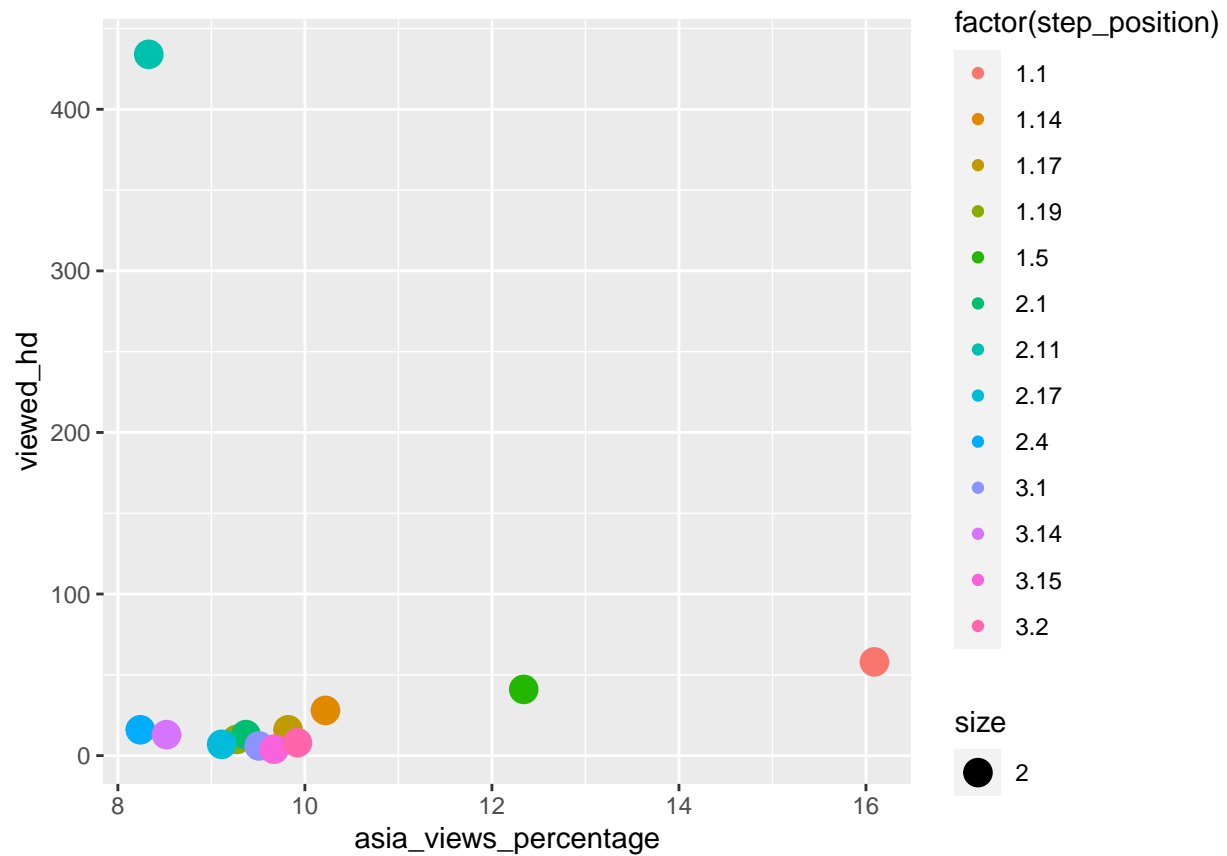
Non native-english speakers has higher usage of transcripts, as evident from graph, with increase in views, there is increase in the usage of transcript

```
view_download
```



The above graph is a scatter of plot for north America view % to step position with respect to total downloads. The graph can be used to understand at what position, the learner considered downloading. Here, we could see the most downloads are at the start therefore representing that learners often downloaded the videos to view later as per their convenience.

```
asia_hd
```



As the number of people started watching videos, the number of viewers watching in HD increased, giving a linear relationship

```
high_views = max(video_stats$total_views) # calculating the highest views seen
high_views
```

```
## [1] 1659
```

The maximum number of people watched

```
low_views = min(video_stats$total_views) # calculating lowest viewership
low_views
```

```
## [1] 446
```

The minimum number of people watched