Item Analysis for Multiple-Choice Achievement Items Using R

Companion Reading: Bandalos, p. 121-131

 # The dataset <PIRLS 2011_Morocco_MC reading items.csv> shows responses of 1,512 Moroccan fourth-graders to the 7 multiple-choice reading comprehension items following one reading passage on the 2011 Progress in International Reading Literacy (PIRLS) 2011 test. Item responses are labeled as "A", "B", "C", "D", or "" = omitted/missing.

The document "PIRLS 2011 released items_Passage 1" contains the complete English-translated text of the reading passage and test items, which were administered in Arabic. The keyed correct answer for each item is indicated.

```
# Import Excel .csv file

> PIRLS_Mor <- read.table("C:/Users/username/Desktop/PIRLS 2011_Morocco_MC reading items.csv", header = TRUE, sep = ",")

# The equivalent file pathname for Mac would be "/Users/username/Desktop/PIRLS 2011_Morocco_MC reading items.csv"

# Verify data imported correctly

> dim(PIRLS_Mor)

> colnames(PIRLS_Mor)

> head(PIRLS_Mor)

# Produce unformatted frequency tables, and use to examine distribution of responses across each category for each item to check omission rates and ensure data entry errors have not been made

> lapply(PIRLS_Mor, table)

# Use Willse's 'CTT' package for traditional item analysis of multiple-choice achievement test items in R

# Install the 'CTT' package, if not already installed: From R main menu choose Packages > Install package(s)... Select any CRAN mirror (website repository for the R software). Scroll down the Packages list, and select "CTT". Click OK.

# Activate the package

> require(CTT)

# Create key of correct options to score items

> PIRLSkey = c("A", "C", "A", "C", "A", "D", "A")
```

```
# Conduct distractor analysis for 3 groups of test-takers with scores in the upper 1/3, middle 1/3 and lower 1/3 of the total score distribution, and save results in a .csv file that can be read by Excel

distractorAnalysis(PIRLS_Mor, PIRLSkey, pTable=TRUE, digits = 3, nGroups = 3, csvReport="C:/Users/username/Desktop/Mor_distractor analysis.csv")

# Equivalent file pathname for Mac would be "/Users/username/Desktop/Mor_distractor_analysis.csv"


# Score item responses (as correct/incorrect, 0/1) and save as a dataframe. Automatically generates a total score column.

> scoredMordata <- data.frame(score(PIRLS_Mor, PIRLSkey, output.scored=TRUE, rel = FALSE))

# Exclude automatically-generated total score variable (“score”) from further analysis by dropping it from the dataframe

> scoredMordata2 <- subset(scoredMordata, select = - (score))


# Obtain additional item analysis statistics, including classical item difficulty (i.e., “p-value”) as each binary item’s mean response value (itemMean), and biserial correlation between each item and the total score with that item removed (bis)

> results <- itemAnalysis(scoredMordata2, itemReport=TRUE, bisFlag = .30)

> results$itemReport
```