# Introduction

## Rationale

Technological advancement has led to the emergence of big data (Gould & Çetinkaya-Rundel, 2014) making data inevitable in our daily life. In addition, powerful computers are now easily available . These developments gave way to the emergence of data science as a field. As a result, the practice of statistics has dramatically changed and has distanced away from statistics education (Finzer, 2013; Wood, Mocko, Everson, Horton, & Velleman, 2018; Zeiffler, Garfield, & Fry, 2018). In this regard, Gould (2010), Horton et al. (2015), Horton (2015) and Hardin et al. (2015) pointed out the importance of developing among students data management skills in introductory and second courses in statistics. Nonetheless, some measures are already in place to lessen the gap between statistical practice and statistics education. In 2005, Franklin et al. (2007) put forth the Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report recommending a framework for statistics education both in the k to 12 and college level. In 2016, the GAISE College Report ASA Revision Committee (2016) revisited the effectiveness of the framework and still found it effective. The framework is now the standard in statistics education in the United States and in many countries that adopted it (Zeiffler et al., 2018).

In the GAISE report, one noteworthy recommendation is the “use of technology to explore concepts and analyze data.” Studies have shown that the use of technology can really improve statistics education; equipping learners with relevant data skills and effective powerful tools in this era where data is very much abundant (Chance, Ben-Zvi, Garfield, & Medina, 2007; Chance & Rossman, 2006; Çetinkaya-Rundel & Rundel, 2017; Doi, Potter, Wong, Alcaraz, & Chi, 2016; Harraway, 2012; Stander & Dalla Valle, 2017). However, when it comes to software used in doing statistical computing and teaching statistics, there is no single statistical computing tool that fits all statistical tasks (McNamara, 2018). Nonetheless, introductory statistics students should be taught a common statistical package such as SAS, SPSS, or R (R Core Team, 2018), enthusing them to continuously learn statistics technology since statistical tools are diverse and eventually evolve through time (Gould et al., 2018).

In our country, leading universities are aware of this issue and have already integrated the use of technology in their curriculum for statistics education. The University of the Philippines for example uses a number of software in its introductory statistics courses and statistics courses (eg. R with RStudio, Python, SAS, SPSS, Stata, MS Excel, QGIS, ArcGIS, Gephi, yEd Graph Editor, and more). Most of the software used are opensource.

In the province, some universities have acquired SPSS to teach statistics courses. On the other hand, some still uses calculators to do and teach statistical computing. Unfortunately, both setup do not lessen the gap between statistics education and statistical practice. In reality, most institutions to which graduates from these universities get employed cannot afford SPSS. One can choose MS Excel as an alternative, however its functions are limited (Biehler, Ben-Zvi, Bakker, & Makar, 2013).

Reproduciblequite

The gap between statistical practice and statistics education.

barriers in using technology (price)

R and RStudio

Efforts in the Philippines

## Statement of the Problem

1. What are the profile variables of the respondents?
2. What are the technology readiness index scores, calculator test scores, and the RStudio test scores of the respondents?
3. What are the technology readiness index scores, the calculator test scores, and the RStudio test scores of the respondents when grouped according to the profile variables?
4. Is there significant difference in the technology readiness index scores, the calculator test scores, and the RStudio test scores of the respondents when grouped according to the profile variables?
5. Is there significant relationship between age and the technology readiness index scores, the calculator test scores, and the RStudio test scores of the respondents?
6. Is there significant relationship between the technology readiness index scores and the RStudio test scores of the respondents?
7. Is there significant difference between the calculator test scores and RStudio test scores of the respondents?

## Statement of the Hypothesis

1. Is there significant difference between the calculator test scores and RStudio test scores of the respondents?
2. the

## Significance of the Study

## Research Framework

## Scope

## Definition of Terms

# Review of Related Literature and Studies

The choice of which software to use in teaching statistics can be quite a challenge given a lot of things to consider. It can be a problem similar to bridging the gap between the practice of statistics and statistics education. Tools for learning statistics can be used easily by starters opposite to when using tools for doing statistics (Gould et al., 2018). However,

# Methodology

## Research Design

## Research Environment

## Respondents

## Research Instruments

## Data Gathering Procedure

## Data Analysis

# Results and Discussion

## Profile Variables of the Respondents

### Gender

**Table 1:** Frequency Distribution of Gender

|  |  |  |
| --- | --- | --- |
| Gender | Freq | Percentage |
| Female | 5 | 62.5 |
| Male | 3 | 37.5 |
| Total | 8 | 100 |

### Have Previous Programming Experience

**Table 2:** Frequency Distribution of Have Previous Programming Experience

|  |  |  |
| --- | --- | --- |
| Experienced | Freq | Percentage |
| No | 4 | 50 |
| Yes | 4 | 50 |
| Total | 8 | 100 |

### Statistical Computing Tool Preference: Calculator or RStudio

**Table 3:** Frequency Distribution of Statistical Computing Tool Preference

|  |  |  |
| --- | --- | --- |
| Preference | Freq | Percentage |
| Calculator | 4 | 50 |
| RStudio | 4 | 50 |
| Total | 8 | 100 |

### Age

**Table 4:** Frequency Distribution and Summary of Age

|  |  |  |
| --- | --- | --- |
| Age | Freq | Percentage |
| 21 | 4 | 50 |
| 22 | 2 | 25 |
| 24 | 1 | 12.5 |
| 39 | 1 | 12.5 |
| Total | 8 | 100 |

|  |  |  |
| --- | --- | --- |
| Mean | Median | SD |
| 23.88 | 21.5 | 6.2 |

## Technology Readiness Index Scores, Calculator Test Scores and RStudio Test Scores of the Respondents

### Technology Readiness Index Scores

**Table 5:** Summary of Technology Readiness Index Scores

|  |  |  |  |
| --- | --- | --- | --- |
| Min | Mean | Max | SD |
| 2.7 | 2.96 | 3.4 | 0.24 |

### Calculator Test Scores

**Table 6:** Frequency Distribution and Summary of Calculator Test Scores

|  |  |  |
| --- | --- | --- |
| Scores | Freq | Percentage |
| Failed | 5 | 62.5 |
| Passed | 3 | 37.5 |
| Total | 8 | 100 |

|  |  |  |  |
| --- | --- | --- | --- |
| Min | Mean | Max | SD |
| 25 | 46.25 | 100 | 25.06 |

### RStudio Test Scores

**Table 7:** Frequency Distribution and Summary of RStudio Test Scores

|  |  |  |
| --- | --- | --- |
| Scores | Freq | Percentage |
| Failed | 3 | 37.5 |
| Passed | 5 | 62.5 |
| Total | 8 | 100 |

|  |  |  |  |
| --- | --- | --- | --- |
| Min | Mean | Max | SD |
| 24 | 54.5 | 86 | 21.23 |

## The Technology Readiness Index Scores, Calculator Test Scores, and RStudio Test Scores of the Respondents When Grouped According to the Profile Variables

### Technology Readiness Index Scores

#### Gender

**Table 8:** Summary of Technology Readiness Index Scores for Gender

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Gender | Min | Mean | Max | SD |
| Female | 2.7 | 2.96 | 3.1 | 0.17 |
| Male | 2.7 | 2.97 | 3.4 | 0.38 |

#### Having Previous Programming Experience

**Table 9:** Summary of Technology Readiness Index Scores for Having Previous Programming Experience

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experienced | Min | Mean | Max | SD |
| No | 2.7 | 2.95 | 3.1 | 0.19 |
| Yes | 2.7 | 2.98 | 3.4 | 0.31 |

#### Statistical Computing Tool Preference: Calculator or RStudio

**Table 10:** Summary of Technology Readiness Index for Statistical Computing Tool Preference

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Preference | Min | Mean | Max | SD |
| Calculator | 2.7 | 2.88 | 3.1 | 0.21 |
| RStudio | 2.8 | 3.05 | 3.4 | 0.26 |

### Calculator Test Scores

#### Gender

**Table 11:** Frequency Distribution and Summary of Calculator Test Scores for Gender

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Gender | Failed | Passed | Min | Mean | Max | SD |
| Female | 4 | 1 | 25 | 37 | 54 | 11.94 |
| Male | 1 | 2 | 27 | 61.67 | 100 | 36.64 |

#### Having Previous Programming Experience

**Table 12:** Frequency Distribution and Summary of Calculator Test Scores for Having Previous Programming Experience

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Experienced | Failed | Passed | Min | Mean | Max | SD |
| No | 2 | 2 | 27 | 54.25 | 100 | 32.5 |
| Yes | 3 | 1 | 25 | 38.25 | 58 | 15.44 |

#### Statistical Computing Tool Preference: Calculator or RStudio

**Table 13:** Frequency Distribution and Summary of Calculator Test Scores for Statistical Computing Tool Preference

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Preference | Failed | Passed | Min | Mean | Max | SD |
| Calculator | 3 | 1 | 25 | 48.75 | 100 | 35.1 |
| RStudio | 2 | 2 | 27 | 43.75 | 58 | 14.71 |

### RStudio Test Scores

#### Gender

**Table 14:** Frequency Distribution and Summary of RStudio Test Scores for Gender

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Gender | Failed | Passed | Min | Mean | Max | SD |
| Female | 3 | 2 | 24 | 43.2 | 68 | 16.87 |
| Male | 0 | 3 | 61 | 73.33 | 86 | 12.5 |

#### Having Previous Programming Experience

**Table 15:** Frequency Distribution and Summary of RStudio Test Scores for Having Previous Programming Experience

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Experienced | Failed | Passed | Min | Mean | Max | SD |
| No | 2 | 2 | 35 | 52.5 | 86 | 23.39 |
| Yes | 1 | 3 | 24 | 56.5 | 73 | 22.22 |

#### Statistical Computing Tool Preference: Calculator or RStudio

**Table 16:** Frequency Distribution and Summary of RStudio Test Scores for Statistical Computing Tool Preference

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Preference | Failed | Passed | Min | Mean | Max | SD |
| Calculator | 2 | 2 | 24 | 53.25 | 86 | 28.74 |
| RStudio | 1 | 3 | 38 | 55.75 | 73 | 14.86 |

## Significant Difference in the Technology Readiness Index Scores, the Calculator Test Scores, and the RStudio Test Scores of the Respondents when Grouped According to the Profile Variables

### Technology Readiness Index Scores

There are no significant difference.

### Calculator Test Scores

There are no significant difference.

### RStudio Test Scores

The Mann-Whitney test

Wilcoxon rank sum test: Male and Female

|  |  |  |
| --- | --- | --- |
| Test statistic | P value | Alternative hypothesis |
| 14 | 0.03571 \* | greater |

## Significant Relationship Between Age and the Technology Readiness Index Scores, the Calculator Test Scores and the RStudio Test Scores of the Respondents

### Technology Readiness Index Scores and Age

No significant relationship.

### Calculator Test Scores and Age

No Significant relationship.

### RStudio Test Scores and Age

No significant relationship.

## Significant Relationship Between the Technology Readiness Index Scores and the RStudio Test Scores of the Respondents

There is no significant relationship.

## Significant Difference Between the Calculator Test Scores and Rstudio Test Scores Of The Respondents

There is no significant difference.

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