

# Meta-Analysis of Student Achievement on Natural Science FLO SCI1 in a 200-Level Biology Course

Dr. Clifton Franklund<sup>1</sup>

## Abstract

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## Keywords

Meta-Analysis — Forest plot — Natural Sciences — Scientific concepts

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## Contents

<b>Introduction</b> .....	<b>1</b>
<b>Methods</b> .....	<b>1</b>
Collection of assessment data .....	1
De-identification of student data .....	1
Data analysis .....	1
Data provenance .....	2
<b>Results</b> .....	<b>2</b>
Structure of the report files .....	2
Summary statistics .....	2
Meta-analysis .....	3
<b>Discussion</b> .....	<b>4</b>
Faculty feedback .....	5
Plan of action .....	5
<b>Acknowledgments</b> .....	<b>5</b>
<b>References</b> .....	<b>5</b>

## Introduction

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## Methods

### Collection of assessment data

Student performance on the first lecture exam in a 200-level Biology course was analyzed. Individual student scores were collected using the new General Education Natural Sciences "scores" data workbook. Student scores were automatically converted to a rubric score by the workbook using the equivalencies shown in Table 1.

These files all contain personally identifiable information (PII) and are, therefore, subject to FERPA regulations. For

**Table 1.** Conversion of percentages to rubric scores

Percent correct	Rubric	Interpretation
0.0 to 49.9%	0	Unsatisfactory
50.0 to 59.9%	1	Beginning
60.0 to 69.9%	2	Developing
70.0 to 84.9%	3	Proficient
85.0 to 100.0%	4	Advanced

this reason, they are not directly shared. Instead, they are stored in a data folder in TracDat: Core Competency: Natural Sciences ⇒ Assessment ⇒ Proof of Concept.

### De-identification of student data

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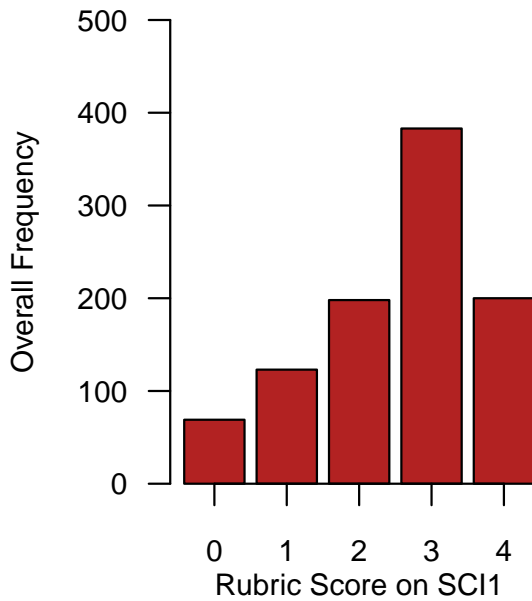
### Data analysis

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- Hmisc (vers. 3.17-4)
- knitr (vers. 1.13)
- lattice (vers. 0.20-33)
- magrittr (vers. 1.5)
- mice (vers. 2.25)
- moments (vers. 0.14)
- papeR (vers. 1.0-1)
- Rcpp (vers. 0.12.6)
- survival (vers. 2.39-5)
- weights (vers. 0.85)
- xtable (vers. 1.8-2)

- R version 3.3.0 (2016-05-03)
- Used packages:
  - car (vers. 2.1-2)
  - dplyr (vers. 0.5.0)
  - forestplot (vers. 1.5.1)
  - Formula (vers. 1.2-1)
  - gdata (vers. 2.17.0)
  - ggplot2 (vers. 2.1.0)

[illegible]



**Figure 1.** A histogram of the distribution of individual rubric score frequencies over all twelve semesters.

The overall overall average rubric score for all 13 semesters was 2.54. The distribution of the rubrics scores is shown below.

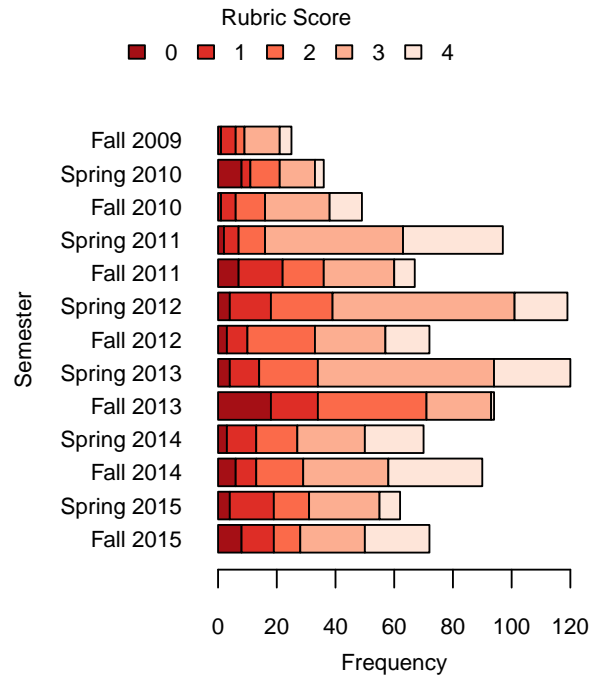
**Table 2.** One-way ANOVA analysis of scores by semester

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Semester	12	142.74	11.89	9.85	0.0000
Residuals	960	1159.22	1.21		

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### Meta-analysis

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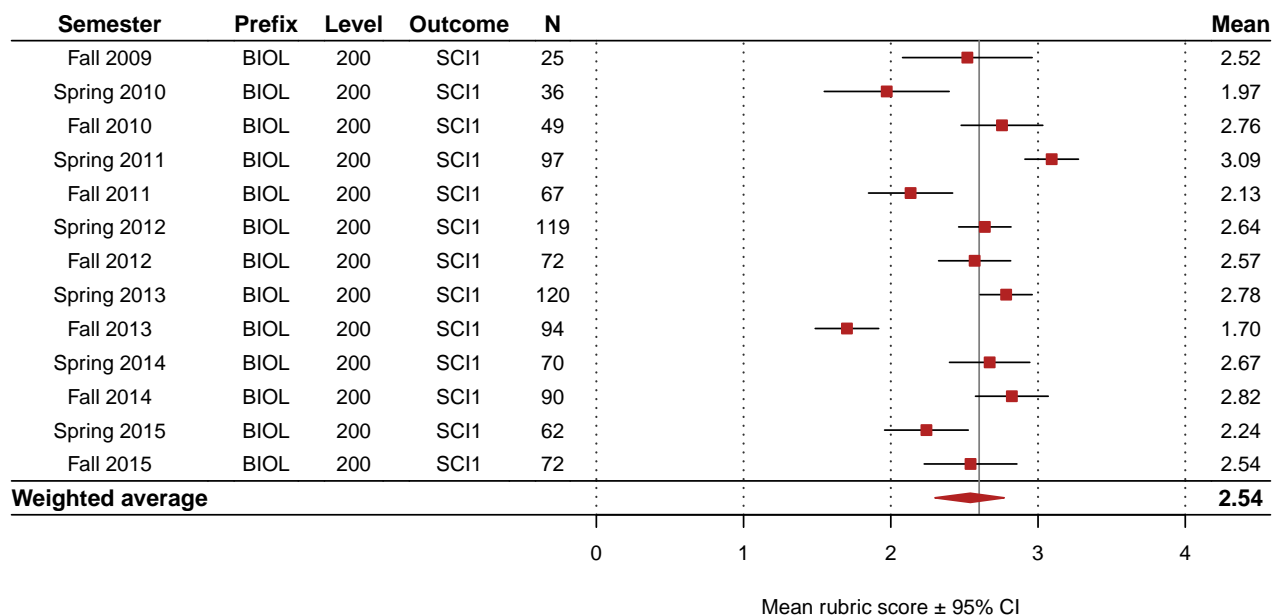


**Figure 2.** A barplot showing the distribution of rubric scores broken down by semester.

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$$\cos^3 \theta = \frac{1}{4} \cos \theta + \frac{3}{4} \cos 3\theta \quad (1)$$



**Figure 3.** A forest plot of the average scores for each semester with a weighted mean estimate for the entire period investigated. Error bars indicate the 95% confidence intervals.

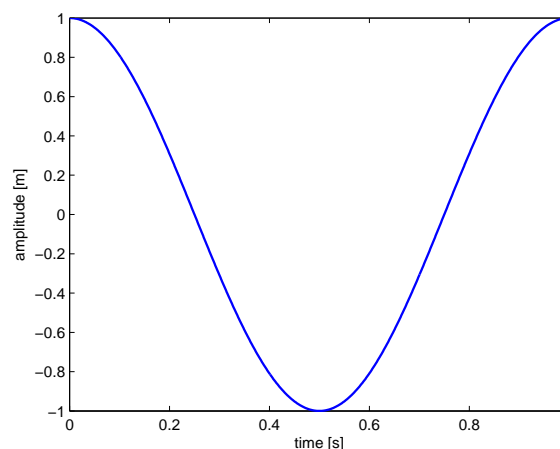
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1. First item in a list
2. Second item in a list
3. Third item in a list

Reference to Figure 4.

## Discussion

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**Figure 4.** In-text Picture

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**Table 3.** Table of Grades

Name		
First name	Last Name	Grade
John	Doe	7.5
Richard	Miles	2

### Faculty feedback

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### Word Definition

#### Concept Explanation

#### Idea Text

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- No modifications
- Modify the assignment
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- Modify the learning outcome
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### Acknowledgments

So long and thanks for all the fish (Figueredo and Wolf, 2009).

### References

Figueredo, A. J. and P. S. A. Wolf (2009). "Assortative pairing and life history strategy - a cross-cultural study." In: *Human Nature* 20, pp. 317–330.