

# GAISE between the Lines

Criteria and a Rubric for Assessing  
Introductory Statistics Textbooks

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# Past Attempts

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- General

- Cobb (1987), “Introductory Textbooks: A Framework for Evaluation,” *JASA*, 82(397), 321-339.

- On-line Websites

- McKenzie and Goldman (2002), “A Website Containing Information on Statistical Textbooks,” *Proceedings of ICOTS6*

- Specific Topics

- Education, Multivariate statistics, SPSS

# GAISE

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[www.amstat.org/education/gaise](http://www.amstat.org/education/gaise)

- 1. Emphasize statistical literacy and develop statistical thinking;
- 2. Use real data;
- 3. Stress conceptual understanding rather than mere knowledge of procedures;

# GAISE

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- 4. Foster active learning in the classroom;
- 5. Use technology for developing conceptual understanding and analyzing data;
- 6. Use assessments to improve and evaluate student learning.

# 1. Emphasize statistical literacy

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- 1. The text models statistical thinking.
- 2. The text uses technology.
- 3. The text has open ended problems and projects.
- 4. The text gives students practice choosing appropriate questions and techniques.
- 5. The text has exercises that assess students' statistical thinking.

# Scoring 1. Statistical Literacy

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- 4 – Complete: All elements are present.
- 3 – Substantial: Elements 1 and 2 are present and two of the others.
- 2 – Adequate: Elements 1 and 2 are present and one other.
- 1 – Minimal: Either 1 or 2 is present.
- 0 – None: No element is present.

## 2. Use real data.

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- 1. The text uses real data.
- 2. The text uses data to answer questions relevant to the context and to generate new questions.
- 3. The text uses a variety of contexts.
- 4. The text makes larger data sets available electronically.
- 5. The same data sets are integrated throughout the text.

## Scoring 2. Real Data

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- 4 – Complete: All elements are present.
- 3 – Substantial: Element 1 is present and three of the others.
- 2 – Adequate: Elements 1 is present and two of the others.
- 1 – Minimal: Either 1 is present and one of the others.
- 0 – None: Element 1 is not present.

### 3. Stress conceptual understanding

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- 1. The text allows readers to discover concepts rather than simply learn methods.
- 2. The text focuses on key concepts in depth.

# Scoring 3. Concepts

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- 4 – Strong focus on key concepts
- 3 – Focus on key concepts
- 2 – A mix of concepts and techniques
- 1 – Focus on techniques
- 0 – Strong focus on techniques

# Strong focus on concepts

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- Using formulas that are linked to the underlying concepts.
- Developing procedures that are linked to concepts.
- Context for data and conclusions.
- Indicating why conditions are important.
- Using simulations to develop and explore concepts.

# Strong focus on techniques

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- Inclusion of computational formulas.
- Step-by-step instructions with no reference to the underlying concept.
- Lack of context for data and conclusions.
- Failing to point out why checking conditions is important.
- Including additional techniques.

## 4: Foster active learning

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- 1. The text presents data in context.
- 2. The text mixes activities – reading, doing, and reflecting.
- 3. The text describes physical explorations before computer simulations.

## 4: Foster active learning

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- 4. The text encourages predictions.
- 5. The text allows readers to think and reflect.
- 6. The text provides summaries of key concepts and learning.

# Scoring 4. Active Learning

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- 4 – Complete: At least 5 of the elements are present.
- 3 – Substantial: At least 4 of the elements are present.
- 2 – Adequate: At least 3 of the elements are present.
- 1 – Minimal: One or two of the elements are present.
- 0 – None: No element is present.

## 5: Use technology

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- 1. The text provides electronic access to large, real data sets.
- 2. The text automates calculations.
- 3. The text includes high quality graphics.
- 4. The text has simulations to illustrate concepts.
- 5. The text explores “What happens if...?” questions.

# Scoring 5. Technology

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- 4 – Complete: At least 4 of the elements are present.
- 3 – Substantial: At least 3 of the elements are present.
- 2 – Adequate: At least 2 of the elements are present.
- 1 – Minimal: At least 1 of the elements are present.
- 0 – None: No element is present.

## 6. Exercises that improve learning.

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- 1. The text has exercises with real data and are used to answer a question in context.
- 2. The text has exercises in a variety of contexts.
- 3. The text has exercises in later chapters that revisit data sets from earlier chapters.

## 6. Exercises that improve learning.

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- 4. The text has a variety of exercises requiring different skills
  - Interpreting and critiquing articles and graphs.
  - Open ended questions.
  - Ask readers to make predictions about results.
  - Practice choosing appropriate questions and analyses.

# Scoring 6. Exercises

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- Estimate the proportion of exercises in the text that involve real data in context.
- Estimate the number of different contexts.
- Estimate how often data sets are reused in later chapters.
- Estimate the mix of exercises.

# Key Topics/Concepts

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- Data production/gathering
- Distribution – sample, population, statistic
- Association – linear regression
- Confidence Intervals – the meaning of confidence
- Test of Hypotheses – p-values

# Example

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- *Just the Essentials of Elementary Statistics*, 10<sup>th</sup> Edition, by Robert Johnson and Patricia Kuby, 2008, Thomson: Brooks/Cole (JK)
- *Statistics: The Art and Science of Learning from Data*, 2<sup>nd</sup> Edition, by Alan Agresti and Christine Franklin, 2009, Pearson: Prentice Hall. (AF)

# Distribution of a sample

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- Histogram
- Sample Mean
- Sample Standard Deviation
  
- JK – Sections 2.3, 2.4, 2.5
- AF – Sections 2.3, 2.4, 2.5