GAISE between the Lines

Criteria and a Rubric for Assessing Introductory Statistics Textbooks
Deborah Rumsey, Ohio State University
W. Robert Stephenson, Iowa State University
Amy G. Froelich, Iowa State University
Jared Schuetter, Ohio State University
Past Attempts

General

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

Specific Topics
- Education, Multivariate statistics, SPSS
GAISE

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

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

- 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

- 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.

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

- 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

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

- 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

- 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

- 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

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

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

- 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

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

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.

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.

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

- 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

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


Distribution of a sample

- Histogram
- Sample Mean
- Sample Standard Deviation

- JK – Sections 2.3, 2.4, 2.5
- AF – Sections 2.3, 2.4, 2.5