

GAISE in Action

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GAISE = Guidelines for Assessment and Instruction in Statistics Education

Basic GAISE Information

- URL: <http://it.stlawu.edu/~rlock/gaise/>
 - College Report
 - K – 12 Report
- College Report endorsed by American Statistical Association
- K – 12 Report seeking endorsement

GAISE Recommendations:

- Emphasize statistical literacy and develop statistical thinking
- Use real data
- Stress conceptual understanding rather than mere knowledge of procedures
- Foster active learning in the classroom
- Use technology for developing conceptual understanding and analyzing data
- Use assessments to improve and evaluate student learning

What it Means to be Statistically Educated

- A list is given in the GAISE report to answer the question, “What it Means to be Statistically Educated”, and I include it in my policy sheet, underneath my 5 goals for the course.
- I use Moore’s Basic Practice of Statistics, 3rd Edition.
- The next set of slides give the objective and the where it is covered in the Basic Practice of Statistics

Students should believe and understand why:

Data beat anecdotes	Not clearly covered
Variability is natural and is also predictable and quantifiable	Chapter 1 Graphs, Chapter 2 Measures of Center & Spread, Chapter 9 Probability, Chapter 10 Sampling Distribution
Random <i>sampling</i> allows results of surveys and experiments to be extended to the population from which the sample was taken	Chapter 7 Sampling, Chapter 8 Experiments
Random assignment in comparative experiments allows cause and effect conclusions to be drawn.	Chapter 8 Experiments

Association is not causation.	Chapter 5 Regression, Chapter 6 Two-way Tables Chapter 8 Experiments
Statistical significance does not necessarily imply practical importance, especially for studies with large sample sizes.	Chapter 15 Inference in Practice
Finding no statistically significant difference or relationship does not necessarily mean there is no difference or no relationship in the population, especially for studies with small sample sizes.	Chapter 15 Inference in Practice

Students should recognize:

Common sources of bias in surveys and experiments.	Chapter 7 Sampling, Chapter 8 Experiments
How to determine the population to which the results of statistical inference can be extended, if any, based on how the data were collected.	Chapter 7 Sampling, Chapter 8 Experiments
How to determine when a cause and effect inference can be drawn from an association, based on how the data were collected (e.g., the design of the study)	Chapter 7 Sampling, Chapter 8 Experiments
That words such as “normal”, “random” and “correlation” have specific meanings in statistics that may differ from common usage.	Chapter 3 Normal Distribution Chapter 4 Scatterplots & Correlation, Chapter 9 Probability

Students should understand the parts of the process through which statistics works to answer questions, namely,

How to obtain or generate data.	Chapter 7 Sampling, Chapter 8 Experiments
How to graph the data as a first step in analyzing data, and how to know when that’s enough to answer the question of interest.	Chapter 1 Graphs, Chapter 4 Scatterplots & Correlation, Chapter 5 Regression, Chapter 6 Two-way Tables
How to interpret numerical summaries and graphical displays of data - both to answer questions and to check conditions (in order to use statistical procedures correctly).	Chapter 1 Graphs, Chapter 2 Measures of Center & Spread Chapter 4 Scatterplots & Correlation, Chapter 5 Regression, Chapter 6 Two-way Tables Chapters 13 – 19 Tests of Significance & CI

How to make appropriate use of statistical inference.	Chapters 13 - 19 Tests of Significance and Confidence Intervals
How to communicate the results of a statistical analysis.	Chapter 1 Graphs, Chapter 5 Regression, Chapter 6 Two-way Tables, Chapters 13 – 19 Tests of significance and Confidence Intervals

Students should understand the basic ideas of statistical inference:

The concept of a sampling distribution and how it applies to making statistical inferences based on samples of data (including the idea of standard error)	Chapter 10 Sampling Distribution Chapters 13 – 19 Tests of Significance and Confidence Intervals
The concept of statistical significance including significance levels and p -values.	Chapters 14 – 19 Tests of Significance and Confidence Intervals
The concept of confidence interval, including the interpretation of confidence level and margin of error.	Chapters 13 – 19 Tests of Significance and Confidence Intervals

Finally, students should know:

How to interpret statistical results in context.	All of the text.
How to critique news stories and journal articles that include statistical information, including identifying what's missing in the presentation and the flaws in the studies or methods used to generate the information.	Not clearly covered, but many of the margin topics relate to media material
When to call for help from a statistician.	Not clearly covered. Added by instructor

Some Uses for GAISE

- Guiding the multiple sections and multiple instructors
 - I have used GAISE to explain to departmental colleagues that *my “weird” teaching ideas* are not strange and are endorsed by a professional organization
 - To set standards across sections
- To set standards across the nation
- To help new instructors of intro. statistics

Using the “Statistically Educated” List

- Guide the instructor throughout the course
- Enable students to look
 - “forward” to what will be covered
 - “backward” to what was covered
- Guide the instructor with assessment
 - Exams and quizzes
 - Assignments
 - Etc.

Assessment

- Collect possible assessment ideas for each of the GAISE “Statistically Educated” objectives at USCOTS during Spotlight Session
- The results will be posted to the following website address after USCOTS
- <http://department.monm.edu/mathcs/Bond/GAISE.htm>
- Idea for the ARTIST website – identify questions with the objectives.