Statistical Education Standards and the Role of Technology

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US Common Core* Standards

Provide a **clear and consistent framework** to prepare students for college and the workforce:

- Help teachers identify the knowledge and skills their students should have, grade-by-grade
- Help educators develop appropriate instructional plans
- Ensures that all students are prepared for success
- Help students and parents set realistic goals for success.

But, CC standards do not tell teachers how to teach!

*State-led effort coordinated by top education boards, in collaboration with teachers, administrators and experts.

GAISE* Suggestions on Using Technology

Recommended **Uses of Technology**:

- Access large, real data sets
- Automate calculations
- Generate & modify appropriate statistical graphics
- Perform simulations to illustrate abstract concepts
- Explore “what happens if...” questions
- Create reports

*Guidelines for Assessment and Instruction in Statistics Education (GAISE), project funded by The American Statistical Association (ASA)

Technology Recommendations* and JMP 1/3

Access large, real data sets

- Sample Data Directory
- Read data of all types
  - Data base
  - Text (txt, csv,…)
  - Internet
  - SAS, R, SPSS, Minitab, ...
- Excel Add-in (Windows)
- Excel Wizard (V11)
- 64 Bit

Automate calculations

- Menu-driven
- Based on data structure
  - Continuous, Nominal, or Ordinal
  - Univariate, Bivariate, and Multivariate
- Default calculations/statistics
- Red triangle for more
- Customize preferences – preferred tests/analyses
- JSL – write your own

*Here from GAISE College Report

Technology Recommendations and JMP 2/3

Generate & modify appropriate statistical graphics

- Graphs for all statistics
- Exploration and visualization
  - Graph Builder
  - Maps
  - Bubble Plot
- Dynamic is key
  - Coloring, marking, labeling and modifying
  - Dynamic linking
- Graph Builder on the iPad

Perform simulations to illustrate abstract concepts

- Built in simulators
  - P-value
  - Power
- Sample Data
  - Sample scripts
  - Calculators
- Teaching Modules
- One-Click Bootstrapping
- JSL - Create your own

Technology Recommendations and JMP 3/3

Explore "what happens if..." questions

- Interact with Data/Variables
  - Exclude and Hide
  - Data Filter
  - Column Switcher
- Interactive Graphics
  - Sliders (spline)
  - Graph Builder
  - Mapping
  - Prediction Profiler
  - Dynamic Trees
- Dynamic Transformations (V11)

Create reports

- Copy and paste, drag and drop
- Save and share scripts
- Save output – eps, png, svg,…
- High resolution
- Create add-ins
- Interactive reports
  - Applications
  - Flash
  - HTML5 (V11)

Teaching (and Learning) Important Concepts

Concept/Challenge:	Platform/Tool:
Sampling distributions	Teaching modules
Interpretation of confidence intervals and p-values	Teaching modules (resampling), p-value animator, bootstrapping
“Correct” graph	Graph Builder
Bivariate and multivariate relationships	Graph Builder, scatter plots, maps, bubble plots...
Understanding models	Prediction Profiler, Partition
What if…?	Hide and exclude, data filter, profiler, column switcher, dynamic transformations (V11)
Sharing Results	HTML5, iPad, high res graphics

Live Examples How JMP Pro 11 Supports the GAISE Technology Recommendations

To follow the demo yourself, download JMP 11 (30 days trial version) and open the JMP journal "Statistical Education Standards and the Role of Technology.jrn"

1. Graph Builder
2. Dynamic visualization
3. Bootstrapping
4. Column transformations
5. Prediction Profiler
6. Teaching modules

Selecting Technology Tools

GAISE report suggests to consider

- Ease of data entry, ability to import data in multiple formats ✓
- Interactive capabilities ✓
- Dynamic linking between data, graphical, and numerical analyses ✓
- Ease of use for particular audiences ✓
- Availability to students, portability ✓

Each of these features is a strength of JMP!

Checklist: Core Technology Features

Must haves for the technology(s) of choice:

- Interactivity (data, graphics, tables,…)
- Effective for both demonstration and exploration of statistical concepts
- Use real-world and “big” data
- Handle multivariate and multi-dimensional data
- Simulations, bootstrapping, and resampling
- Allow users to ask, “What if…?”
- Adaptable, expandable, flexible – to fit changing needs

Thank you for your interest!

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References

- **Learning** about JMP
  - **Academic webcasts on-demand** for professors and students
    - » http://www.jmp.com/about/events/ondemand/
  - JMP **application areas** with video demos
    - » http://www.jmp.com/applications/
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