Data-Informed Decision-Making and the Identification of School Improvement Needs

Data Collections Conference
August 29th, 2014

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Operations Analyst III
Office of School Improvement
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Education Data Analysis for Beginners
Survey of the Room

• Location
  – State
  – District
  – School
  – Other

• Position Type
  – Leadership
  – Management
  – Data/research
  – School support staff
  – Other

• Level of Experience/Knowledge with Data
  – Minimally experienced/knowledgeable
  – Moderately experienced/knowledgeable
  – Highly experienced/knowledgeable
The World of Data

- Data acquisition
- Data integration
- Data architecture
- Data warehousing
- Data security and privacy
- Data governance
- Data management
- Data quality

- Data identification and preparation
- Types of data analysis
- Types of data visualization
- Data planning
- A framework for data analysis
- Identifying and monitoring indicators
- Decision-making
RESEARCH, EVALUATION, MONITORING, AND DATA ANALYSIS FRAMEWORK FOR SCHOOL IMPROVEMENT

**STAGE**
- Planning
- Initial Analysis and Decision-Making
- Program Development
- Program Implementation
- Program Completion, Summative Evaluation, Decision-Making

**RESEARCH, EVALUATION, AND DATA**
- Initial Data Collection, Preparation, & Analysis
- Development of Evaluation and Data Analysis Plan
- Formative Assessment, Evaluation, and Data Analysis
- Collection and Preparation of Outcome and Impact Data
- Summative Assessment, Evaluation, and Data Analysis

**MANAGEMENT**
- Initial Reporting, Visualization, and Interpretation
- Development of Research Plan (Problem, Scope, Purpose, and Guiding Questions)
- Formative Reporting, Visualization, and Interpretation
- Summative Reporting, Visualization, and Interpretation

**LEADERSHIP**
- Initial Intervention Related Decision-Making
- Decision-Making Resulting in Changes to Policies, Processes, Practices
- Formative Decision-Making and Program Modifications
- Summative Program Decision-Making
- Completion of Program
- Decision-Making Resulting in Changes to Policies, Processes, Practices

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“Making Education Work for All Georgians”
www.gadoe.org
DATA IDENTIFICATION & PREPARATION
Data Identification: Matching Your Needs to the Data

Step 1: Identify your topic
Step 2: Narrow your topic, develop a targeted research focus for your data exploration
Step 3: Determine all the data points (variables) that will allow you to capture the relationships and changes over time you are interested in measuring
Step 4: Decide upon the best data points and the nature of the variables to be used
Data Identification:
Common Data Sources

Achievement | Behavior | Demographic

• Student end of year/course test scores
• Student benchmark assessments
• Student course tests
• Advanced Placement, ACT, SAT
• Graduation rates
• Retention status
Data Identification: Common Data Sources

Achievement | Behavior | Demographic

- Attendance
- Discipline
Data Identification: Common Data Sources

Achievement | Behavior | Demographic

- Race
- Sex or gender
- Socio-economic status (captured through free and reduced-price meals)
- English language learner
- Zip codes
Data Identification:

Going Beyond Your SIS and the SLDS

Quantitative:

• School-level data
• Classroom-level data
• Community data

Qualitative:

• Students, parents, teachers/staff
  – Attitudes
  – Perceptions
  – Engagement
• Community data
Data Collection & Preparation: Common Pitfalls to Avoid

• Assuming the data is clean
• Excluding or including outliers
• Ignoring context - context is very important!
Cleaning and preparing your data may be tedious, but this process will save you the embarrassment of presenting inaccurate results.
Data Analysis for Beginners

TYPES OF DATA ANALYSIS
Making Meaning from Data: What Can We Do With Data?

• **Describe** the basic characteristics of interest (*What does the data tell us about the basic features of our group of interest?*)

• **Correlate** relationships between data (*What is the nature of the relationship between two variables?*)

• **Infer** about a large group based on sample data (*What does the data collected on 40 students in a school tell us about the school’s students as a whole?*)

• **Find Cause and Effect** relationships (*Does x cause y?*)
Important Takeaway:
Does Your Data Analysis Reflect Reality?
Data Analysis for Beginners

TYPES OF DATA VISUALIZATION
Data Visualization: Purpose and Goals

- To present more data than otherwise possible
- To illustrate patterns that are not immediately apparent
- To compare values or show changes over time
- To make it possible to answer questions—even questions you didn’t know you should be asking until you saw the pattern of the data in the visualization

Source: Stacey 2013
Examples of Visualizations Common in Education

- **Bar Chart** | **Scatter Plot** | **Radar Chart** | **Pie charts**

- Good for comparing:
  - 1-3 groups across multiple points in time
  - 1-3 groups at one point in time across multiple measures on the same scale

- Only useful if you can segment all of the data into a few discrete groups

**CRCT Comparison Scores**

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<th>ELA</th>
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<tr>
<td>State</td>
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<td>841.5</td>
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</tbody>
</table>
Examples of Visualizations Common in Education

Bar Chart | Scatter Plot | Radar Chart | Pie charts

- Good for comparing:
  - Two variables that are believed to correlate with one another
  - Scores for a large number of groups or individuals on two data points at one point in time
- Allows for each case to be visualized separately
- Provides a strong visual if relationship between variables is obvious

Attendance Rates and GPAs for a Math Class

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Examples of Visualizations Common in Education

Bar Chart | Scatter Plot | **Radar Chart** | Pie charts

- Good for comparing:
  - 1-2 groups or individuals across 3-6 categories on the same scale
  - 1 individual or group to a district, state, or national average
- Not a good choice when there is little variation between compared values or across categories

**CRCT Scores for All Subjects**

- Mathematics: 842 839
- English Language Arts: 835 845
- Social Studies: 805 821
- Science: 829 835
- Reading: 825 840

**Student** vs **School Average**
Examples of Visualizations Common in Education

Bar Chart | Scatter Plot | Radar Chart | **Pie charts**

“There is no data that can be displayed in a pie chart, that cannot be displayed BETTER in some other type of chart.”

-John Tukey

CRCT Mathematics Performance Levels
Choosing the Right Visualization

• Identifying the right visualization is not as easy as picking from a list of options in Excel.

• The right visualization can convey deeper insight than the numbers alone.

• The wrong visualization might confuse people, distort your message, or even convey the wrong message.

Adapted from: Stacey, 2013.
Important Takeaway: Don’t Use Pie Charts!
Data Can Be **POWERFUL, Beautiful, and Fun**

Source: The Joy of Stats, Presented by Hans Rosling, BBC4
What Insights Can We Apply to Our Work in Education?

“I know having the data is not enough. I have to show the data in ways people both enjoy and understand.”

-Hans Rosling
Important Takeaway: Working With Data is Like Going to the Gym

Step 1. Start off with what you can do without hurting yourself

Step 2. Set goals for personal development and work at getting a little better every day

Step 3. Enjoy the attention as others marvel at your results!
Learn More…
Reading Material

• Achieving a Wealth of Riches: Delivering on the Promise of Data to Transform Teaching and Learning
• Cutting through the “data-driven” mantra: Different conceptions of data-driven decision making
• Data for School Improvement: Factors for designing effective information systems to support decision-making in schools
• Data use in the school and classroom: The challenges of implementing data-based decision making inside schools
• Making Sense of All Your Data
• Making Sense of Data-Driven Decision Making in Education: Evidence from Recent RAND Research
• Teachers’ Use of Student Data Systems to Improve Instruction
Learn More…
MOOCs and Self Study Courses

• Coursera:
  • Data Analysis
  • Statistics: Making Sense of Data
  • The Data Scientist’s Toolbox
  • Getting and Cleaning Data
  • Exploratory Data Analysis
  • Analysis and Statistical Inference

• MIT OCW:
  • Statistical Thinking and Data Analysis
  • How to Process, Analyze and Visualize Data
  • Data, Models, and Decisions
  • Data Mining
  • Communicating with Data
  • Statistics and Visualization for Data Analysis and Inference

• Udacity
  • Data Analysis with R: Investigate, Visualize, and Summarize Data
  • Intro to Statistics: Making Decisions Based on Data
  • Intro to Descriptive Statistics
  • Intro to Inferential Statistics

• edX
  • Data, Analytics and Learning
  • Foundations of Data Analysis
  • Evaluating Social Programs
  • Introduction to Statistics: Descriptive Statistics
  • Introduction to Statistics: Inference

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Learn More…

Presentation Citations and References

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