




The Ninth Annual International
Campbell Collaborative Colloquium

A Systematic Approach to Data-based Decision Making in Education

Randy Keyworth
Jack States



“ Promoting science...
is about ensuring that scientific
data is never distorted or
concealed to serve a political
agenda --and that we make
**scientific decisions based on
facts,**
not ideology. ”

President Barack Obama
March 9, 2009

“We need solid, unimpeachable information that identifies what's working and what's not working in our schools.”

“Without the data, we cannot even have the conversation, let alone discuss solutions.”

Arne Duncan
Secretary of Education
Wall Street Journal Opinion
April 22, 2009

DOE Data-Based Decision Making Initiatives

1. Improve quality of standardized tests and raise standards that are internationally benchmarked (**national academic standards**)

Comparison of State AYP Requirements

THOMAS B. FORDHAM INSTITUTE

THOMAS B. FORDHAM INSTITUTE (2008)

DOE Data-Based Decision Making Initiatives

1. Improve quality of standardized tests and raise standards that are internationally benchmarked (**national academic standards**)
2. Build robust data systems to aggregate and disaggregate student outcome data
 - link teachers to students outcomes** -- to distinguish between effective and ineffective teachers
 - to link effective teachers to their colleges of education** -- to distinguish between effective and ineffective programs
3. Invest heavily in **teacher and principal quality initiatives** (including performance pay for effective teachers)

Today's Schedule

The Role of Data-Based Decision Making in Evidence-Based Education States

Critical Assumptions in Date-based Decision Making Keyworth

Types of Data States

Building a Data-Based Decision Making Culture Through Performance Management Keyworth

Key Indicator Systems: Why We Need to Systematize Decision Making States



30 years studying “**research to practice**” issues...

from the “**practice**” side



1978 - 2004

operated "research based" special education services in "real-world" settings...

...provided a "laboratory" setting for longitudinal study of research to practice, implementation and sustainability



2004 - present

independent, non-profit operating foundation

promote evidence-based education policies and practices

act as a catalyst to facilitate communication, cooperation and collaboration between individuals and organizations currently engaged in evidence based education

The Wing Institute's Strategic Vision

Identify **exemplars** in evidence-based education

research
models

individuals
programs

policies
organizations

Develop **networks** to facilitate collaboration

Provide **support** for new ideas, research, and publications

Facilitate **cross-discipline** cooperation

The Wing Institute's Strategic Vision

Increased focus on

Research to Practice

in the **Real-world**

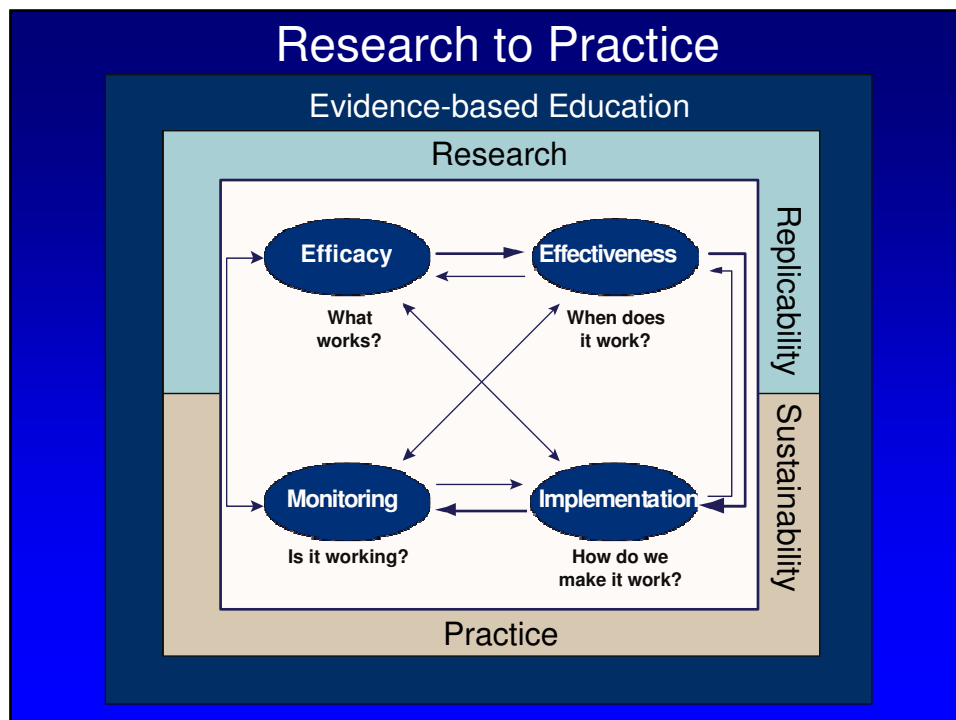
in **Real-time**

**implementation
and
sustainability**

“Research to Practice” Roadmap

The purpose of the “Roadmap” is to:

- Provide an **expanded model** for bridging the gap between research and practice
- Define the **primary components** of an evidence-based culture, their functions, and how they relate to each other.
- Illustrate the necessary and continuous **reciprocal nature** of influence between research and practice



**The Role of
Data-Based Decision Making
in Evidence-Based Education**

**Critical Assumptions
in Data-Based Decision Making**

Data-based Decision Making has two distinct components

Data-based

meaningful and accurate
data being collected and
displayed

Decision Making

accurate interpretation of the
data and selection of effective
response
(problem solving)

Five Assumptions for Effective Data-based Decision Making

Data-Based Assumptions

1. Reliable and valid data are available.
2. Interventions are implemented with integrity.

Decision Making Assumptions

3. Decision makers have the ability to analyze data.
4. Decision makers know what to do when data indicate a change is necessary.
5. Professional judgment is objective.

Assumption 3: Decision makers have the ability to base decisions on data.

Most student-level data displayed in graphs

Visual inspection of graphic data displays can be unreliable

Reviewers of behavioral journals
(DeProspero & Cohen, 1979)

IOA = 61%

Assumption 3: Decision makers have the ability to base decisions on data.

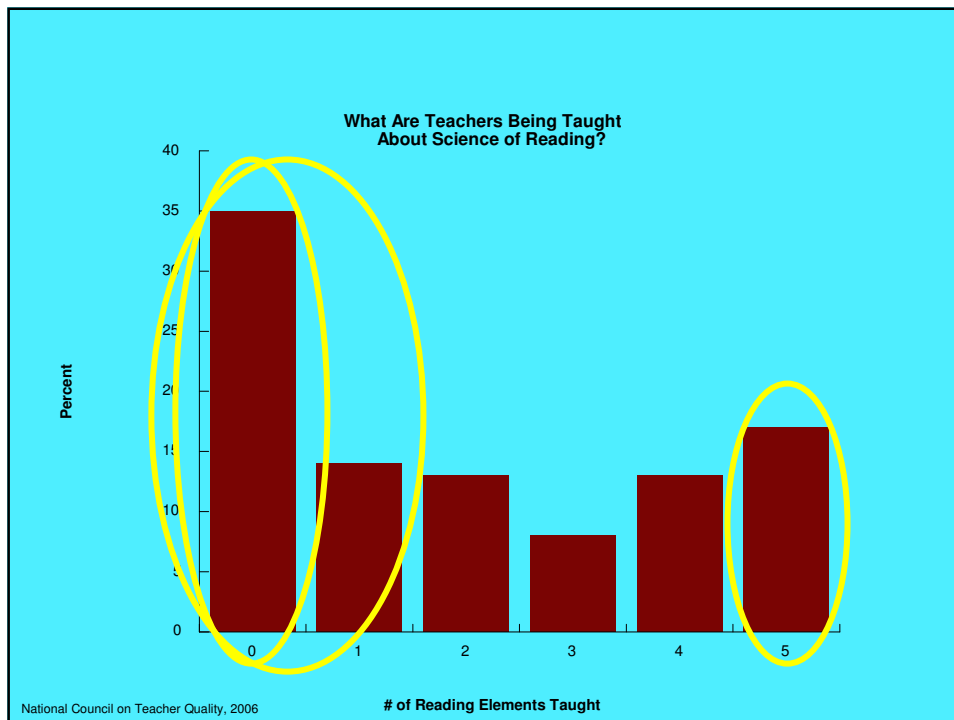
Accuracy can be improved with training and visual aids

Accuracy with criteria and training increased from .46 to .81 (Hagopian, et al. 1997)

Accuracy visual aids and training increased from .55 to .94 (Fischer, et al. 2003)

Assumption 4: Decision Makers Know What to Do When Data Indicate Change is Necessary

- Knowing there is a problem and knowing what to do about it are very different things.
- Are we preparing educators to identify and implement evidence-based interventions?



Are We Training Educators to be Evidence-based?

Survey of School Psychology Directors of Training

(Shernoff, Kratochwill, & Stoiber, 2003)

Knowledge of Evidence-based Interventions

29% directors ~~Knowledge~~

41% programs ~~Training~~

Assumption 5:

Professional judgment is objective

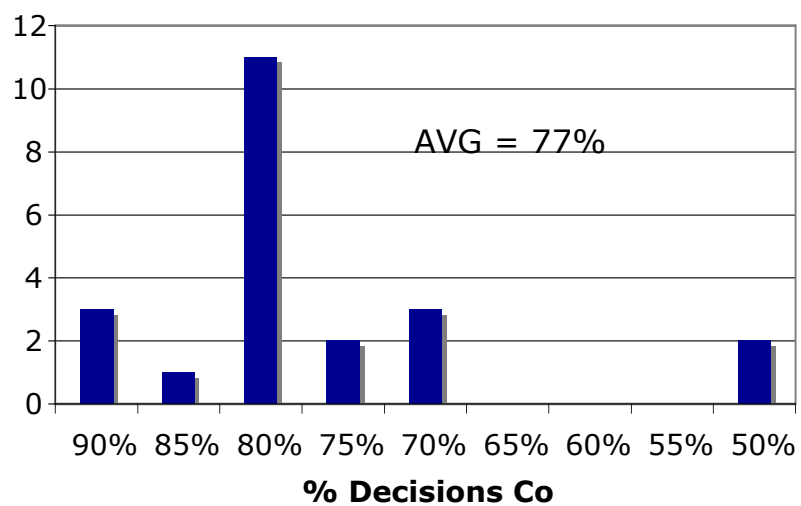
1. **Data-based decision making is still an uncertain practice.**
 - complex issues of cause and effect
 - incomplete data
2. **False sense of accuracy**
 - professional arrogance
 - art vs. science
 - lack of feedback
3. **Individual limitations**
 - professional bias
 - errors in reasoning

The fallibility of professional judgment:

a false sense of accuracy

Professional Arrogance: ignoring the fact that mistakes are inevitable

What percent of decisions turn out to be



The fallibility of professional judgment:
a false sense of accuracy

“art vs. science”

- **decisions made on the basis of intuition**
- **empirical data not only waste of time, diminishes quality of service...it limits creativity and spontaneity**
- **professionals “trust” their professional judgment**

The fallibility of professional judgment:
a false sense of accuracy

<u>CRITERIA FOR TREATMENT CHOICES</u>	<u>CLIENT</u>	<u>PHYSICIAN</u>
Your intuition (gut feeling) about what will be effective	77%	22%
Your demonstrated track record of success based on data you have gathered systematically and regularly	39%	92%
Results of controlled experimental Studies	37%	92%

Gambrill and Gibbs, 2002

The fallibility of professional judgment:
a false sense of accuracy

“science vs. art”

- failure to recognize the limitations of existing scientific research
- failure to recognize the role and fallibility of professional judgment

The fallibility of professional judgment:
a false sense of accuracy

Lack of Feedback

- lack of systematic feedback from peers or colleagues
- lack of organizational systems for providing feedback on outcomes related to decisions
- difficulty with “complex systems” to ascertain cause and effect

The fallibility of professional judgment:

bias

Biases that can interfere with judging progress and causation

- Being swayed by hindsight
- Being overconfident
- Engaging in wishful thinking
- Having an illusion of control
- Overlooking the role of chance (coincidences)
- Seeking only data that support preferred views
- Overlooking the interaction between predictions and their consequences
- Mistaking correlation for causation

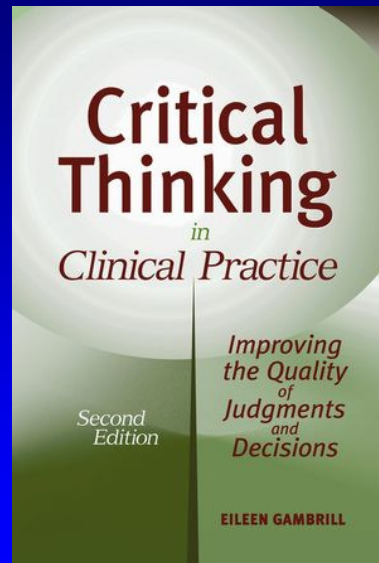
Critical Thinking in Clinical Practice - Improving the Quality of Judgments and Decisions, Eileen Gambrill

The fallibility of professional judgment:

errors in reasoning

Common errors in reasoning that can effect perceptions and decisions.

Circular Reasoning	Shifting the Burden of Proof	Analogy
Non-Sequitur	Self-Referential Fallacy	Humor
Post Hoc	Ad Hominem	Extrapolation
Red Herring	Sidestepping/Avoiding the Question	Circumstantial Evidence
Equivocation	Suppressed Evidence (Stacking the Deck)	Straw Man
False Dichotomy	Statistics	Guilt by Association
Lying	Jumping to Conclusions	Best-in-Field Fallacy
Authority	Traditional Wisdom	



Five Assumptions for Effective Data-based Decision Making

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Good News / Bad News

Bad News: If any assumption is not true then our ability to effectively implement data-based decision making is compromised.

Good News: There are emerging approaches that make it possible for improve our performance in each of these areas.

Types of Data

**Building a
Data-Based Decision Making Culture
Through Performance Management**

Data-based Decision Making
relies on Staff Performance

In order for a data-based decision making system to be effective, staff must:

implement it	correctly	over time
compliance	competence	sustainability

Data-based Decision Making **compliance / competence**

- ask the right questions
- identify appropriate data to collect (validity)
- implement interventions according to plan (treatment integrity)
- collect data accurately (reliability)
- display / analyze data
- interpret data / draw correct conclusions
- give / receive feedback based on the data
- modify interventions based on data

Data-based Decision Making **sustainability**

- implemented with procedural fidelity and desired outcomes (effectiveness) at the consumer level
- maintains over time
- maintains over generations of practitioners and decision-makers
- operates within existing resources (financial, staff, materials) and existing mandates
- becomes institutionalized, routine...
“the way we do business”

National Implementation Research Network (NIRN)

Sustainable Practice

requires:

a social / cultural change process across all levels of an organization

a long term, ongoing, developmental process

respect and accommodation of the uniqueness of every aspect of the culture

National Implementation Research Network (NIRN)

Research on Implementation

The most common forms of implementation...

paper implementation: new policies and procedures put in place

process implementation: new operating procedures put in place

information dissemination

training

supervision

have repeatedly been shown to be ineffective

performance implementation: monitoring activities and outcomes and responding to the data

National Implementation Research Network (NIRN)

What is an Organizational Culture?

The complex interaction of **formal and informal contingencies** governing the behavior of all stakeholders, embodied in:



Building a Data-based Decision Making Culture

All organizations have cultures...

most don't support data-based decision making

Baseline Cultural Obstacles

staff resistance to a data-based decision making culture:

- long standing mistrust of the purpose of data
- educator autonomy, implicit power relationships
- cynicism about fads, new ideas, education reform
- resistance to performance feedback
- data collection is too difficult
- data collection causes too much change
- desired outcomes take too long to materialize
- perceived costs exceed perceived benefits

Building a Data-based Decision Making Culture

Data-based decision making cultures deliberately shape all cultural contingencies to reinforce the effective use of data in decision making.

- increase reinforcement for the target behaviors
- decrease aversive consequences for the target behaviors
- decrease reinforcement for competing behaviors
- increase aversive consequences for competing behaviors

Using Performance Management to Build a Data-based Decision Making Culture

Performance management strategies are essential to accomplish this goal:

- clear, measurable outcomes, goals, measures
- effective data feedback system
- deliberate, measurable intervention
- ongoing monitoring
- analysis
- adaptation and innovation

Overcoming Baseline Cultural Obstacles: Calibration, Process and Engagement

a "learner centered" culture (calibration)

- focus on student learning and educational practices
- establishing consensus on standards, definitions, goals

a culture of "inquiry" rather than "compliance" (process)

- use of data to answer questions, problem solve
- use of data-based decision making at all levels of the organization
- not having all of the answers

a culture of "universal participation" (engagement)

- wide-spread involvement (ownership, pride, participation)
- collaboration across disciplines
- giving, receiving, and using feedback
- data analysis as positive, non-threatening experience

Overcoming Baseline Cultural Obstacles: Alignment

Alignment of all organizational cultural components so that contingencies consistently support data-based decision making

policies
practices
values
resource allocations
data systems
 feedback systems
 reporting
requirements

program evaluation
recruitment & hiring
initiatives
job expectations
compensation
staff training
staff coaching
staff feedback

Using Performance Management for cultural alignment

Goals: Increase the number of "Qualified Staff"

Definitions: staff meet regulatory qualifications
staff share common values about data, accountability, feedback and problem solving
staff have technical skills in instruction, data analysis, problem solving...

Outcomes: staff positions filled by qualified staff
staff retention

Using Performance Management for cultural alignment

	Strategies	Process Measures	Outcome Measures
staff training	X	X	X
staff feedback	X	X	X
staff evaluation	X	X	X
recruitment	X	X	X
selection	X	X	X
hiring	X	X	X
policies	X	X	X
practices	X	X	X
resource allocations	X	X	X
job expectations	X	X	X
compensation	X	X	X
initiatives	X	X	X

Strategies for Improving Decision Making

Data Analysis Teams

1. Membership

cross discipline (administrator, support staff, classroom staff)
data facilitator

2. Goals

Apply data-based decision making strategies to desired outcomes
Reinforce "inquiry" culture
Provide training and feedback

3. Tools

Checklists data displays
Scripts technology

4. Process

Ongoing meetings
Ongoing review

- "Never doubt that a small group of thoughtful, concerned citizens can change the world. Indeed it is the only thing that ever has." Margaret Mead
- Evolution is chaos with feedback. □Joseph Ford

Key Indicator Systems: Why We Need to Systematize Decision Making

Efficacy Research (What Works?)

- Research conducted to identify promising practices
- Establishes a causal relationship between an intervention and its impact on behavior.
- Often conducted in highly structured and controlled laboratory settings to clearly demonstrate impact and causation
- Precision is often achieved with highly trained change agents, carefully screened participants, adequate resources, and close supervision.
- Currently, this is the most common form of published educational research.

Effectiveness Research (When Does it Work?)

- Research conducted to answer questions about the impact and robustness of interventions when taken to scale in more typical practice settings
- Primarily concerned with when an intervention works in the context of the following dimensions.
 - ↓ characteristics of students, setting
 - ↓ leadership and instructors
 - ↓ resources, training available
 - ↓ culture, level of commitment
- Less common than efficacy research

Implementation (How do we make it work?)

- How do we make this intervention work in this particular setting?
- Translates effectiveness research to practice, from “general settings” to a “particular setting”
- Explicit, systematic process for analyzing and addressing the critical variables necessary for an intervention to be successfully adopted, implemented and sustained in a particular setting.
- Analyzes the contingencies operating on various stakeholders in a particular practice setting and how they influence adoption and sustainability of an intervention.

Performance Monitoring (Is it Working?)

- To assure that the intervention is actually being effective must monitor the impact of the intervention in the setting (practice-based evidence).
- Monitoring must occur:
 - ↓ student level (to ensure progress and be able to modify components of the intervention when necessary)
 - ↓ systems level (to be able to make systems level decisions and policy choices)



Part II

The Role of Data-based Decision Making

QuickTime™ and a decompressor are needed to see this picture.

Jack States
The Wing Institute

What Is the Purpose of the Campbell Collaboration?

Mission

To help people make well-informed decisions by preparing, maintaining and disseminating systematic reviews in education, crime and justice, and social welfare.

Why?

To Improve People's Lives

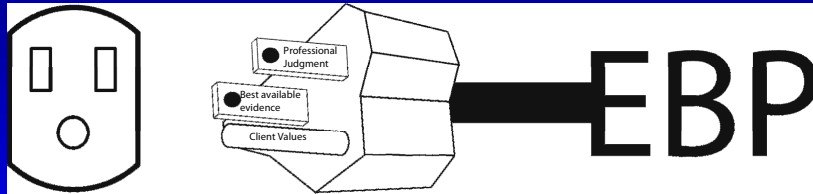
Premise

Data-based decision making is indispensable to increasing the probability that socially important outcomes will be achieved.

How?

To help people make well-informed decisions by preparing, maintaining and disseminating systematic reviews in education, crime and justice, and social welfare.

What Is Evidence-based Practice? “A Decision-making Model”



Sackett et al (2000)

- EBP is a **Client Values Evidence** that places emphasis on evidence to:
 - ☞ guide decisions about which interventions to use;
 - ☞ evaluate the effects of an intervention.

Why do we select evidence-based practices?

The Key
Research tells us best
Data-based Decision Making
what works and when it works

Research → Practice

Why Data-based Decision Making?

To Make Better Choices

1. Increase Effectiveness
2. Increase Efficiency
3. Provide Accountability
4. Guide Quality Improvement Efforts

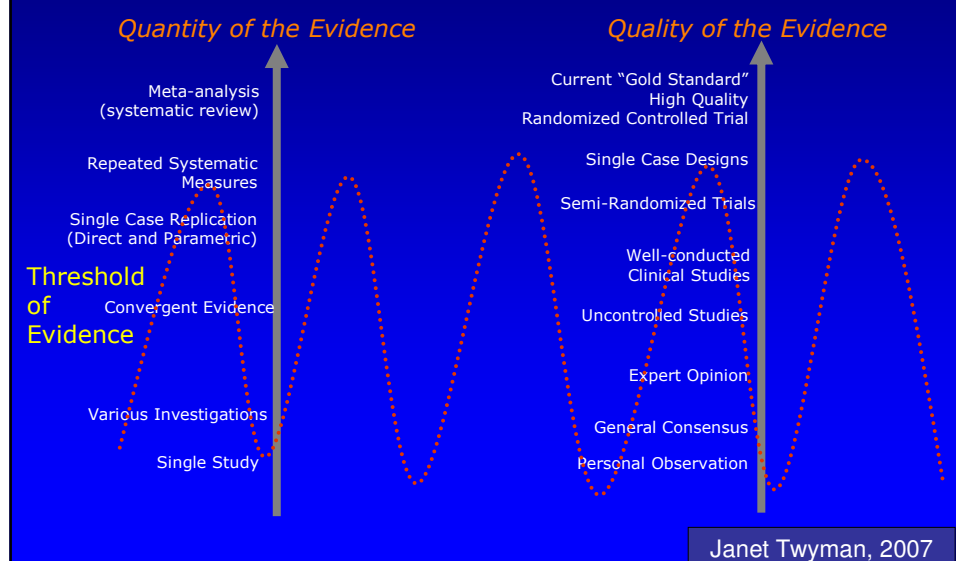
What Are Critical Decision Points?

1. Selection of a practice or intervention
2. Assessment of the effectiveness of a practice
3. Assessment of treatment integrity
4. Selection of staff
5. Allocation of resources

Assumption

- **Assumption:** There are sufficient numbers of studies to answer questions of efficacy and effectiveness
- **Current Status:** Unfortunately there are not enough studies (of strength and quality)
 - 📁 Campbell Collaborative
 - 📁 What Works Clearing House

Continua of Evidence



Assumption

- **Assumption:** If we implement an evidence-based practice we will achieve the desired results
- **Current Status:** Unfortunately, practices are not always implemented as designed
- **Immediately following training treatment integrity begins to decline.**

Mortenson & Witt, 1998

Noell, Witt, LaFleur, Mortenson, Ranier, & LeVelle, 2000

DiGennaro, Martens, & McIntyre, 2005

Assumption: Staff Can Implement Interventions with Integrity

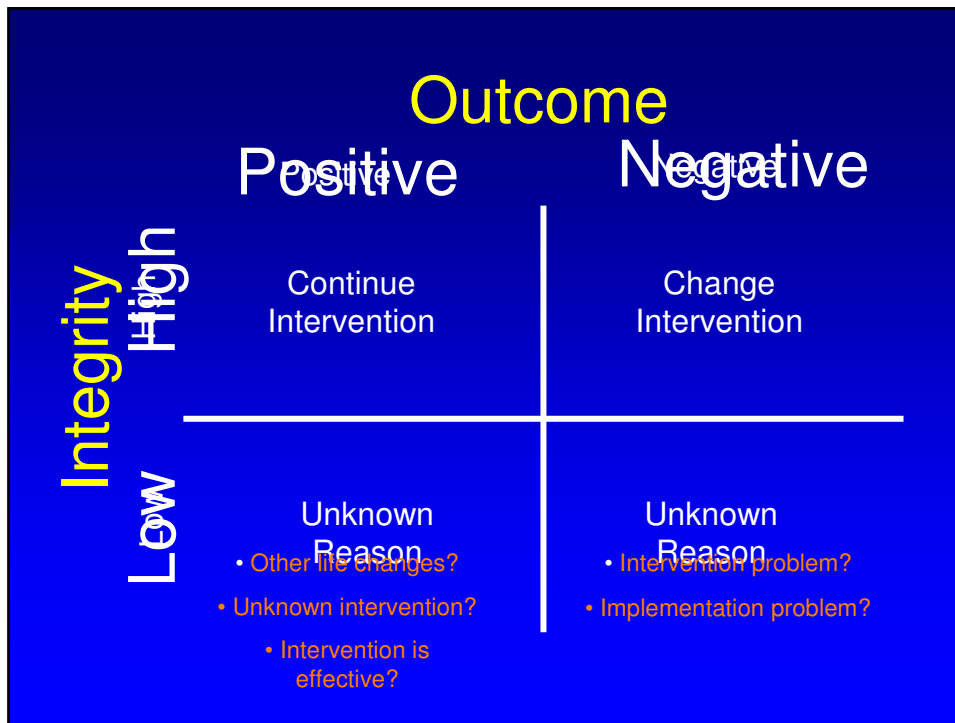
Evidence-based drug education programs implemented with integrity only 19% of the time.

Hallfors & Godette (2002)

☞ This may be an overestimate.

☞ 52% reported that programs were modified or adapted.

No reason to believe that other curricula and social interventions are implemented with any better integrity.



Context

Progress monitoring is an effective method of comprehensive school reform.

4 X 10% increase in per pupil spending.

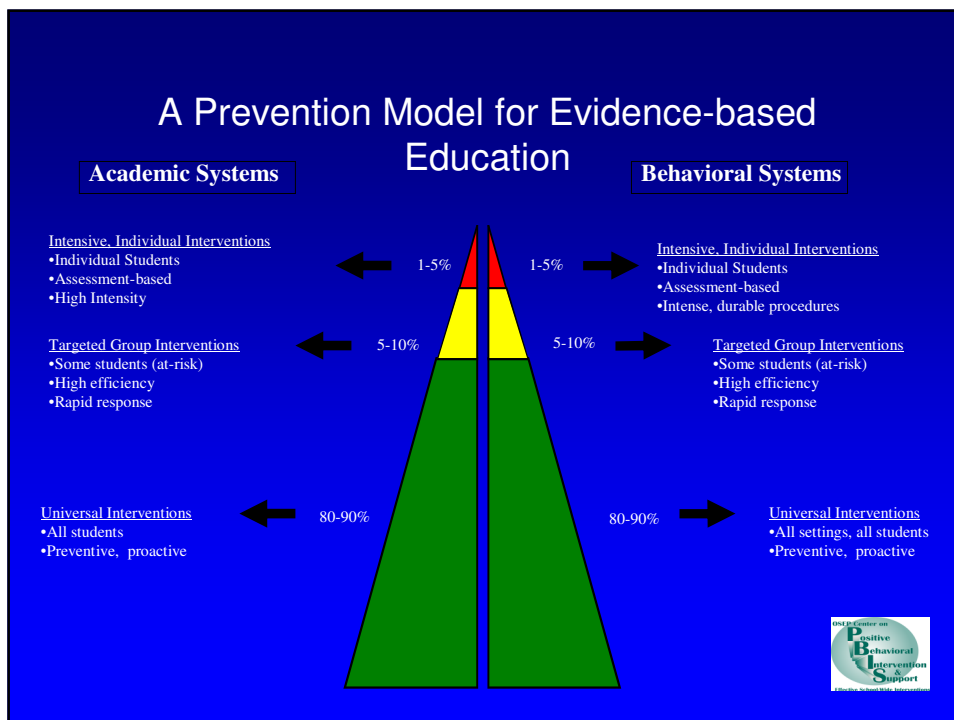
6 X vouchers; increased accountability.

64 X charter schools.

Yeh (2007)

Assumption

- **Assumption:** An evidence-based intervention works for all students
- **Current Status:** Unfortunately, few if any interventions work for everyone



Conclusion

1. **Data-based decision making** is core to building an evidence-based culture
2. An evidence-based practice cannot exist without **treatment integrity**
3. **Progress monitoring** is an essential to informing us that the evidence-based intervention is working

Part III

Critical Assumptions in Data-based Decision Making

Randy Keyworth

Part IV

TYPES OF DATA

Jack States

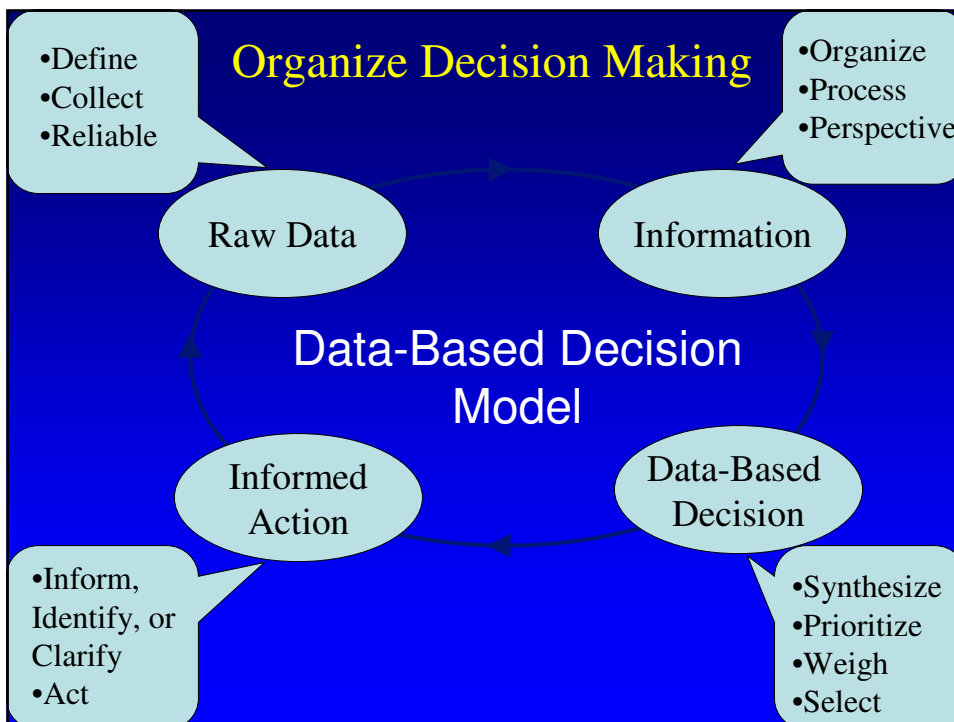
**“In God we trust; all others must
bring data.”**

--W. Edwards Deming, physicist and quality improvement
pioneer

Assumption: Reliable and Valid Data are Available

- **Academic performance:**
 - ☞ Sufficient for reading and math at Elementary age
 - ☞ Insufficient for majority of subjects for above elementary age
- **Social behavior:** Insufficient established measures
- **Systems:** Sufficient

“...analysis paralysis, or the process of being over-stimulated by data...” Joe McKendrick (2003)



Assumption

- **Assumption:** It is enough to monitor student achievement through high stakes testing
- **Current Status:** High Stakes Tests
 - ☞ Are infrequent
 - ☞ Are not prescriptive for individual students (only groups)

Use Data That Drives The System

Three Categories of Data

1. Outcome Data - Are we achieving our Goals?
2. Process Data - Is the system working?
3. Satisfaction Data - Are we meeting stakeholders expectations?

Outcome and Process Data

Formative

Data collected after instruction has been completed, at the end of a course or program, is used to assess the extent to which program goals have been achieved. This data is used to make program adjustments, curriculum decisions, and to improve instructional practices.

- Demographic information
- Lesson Quiz
- Standardized test
- Chapter Test
- Teacher credentials
- Curriculum Based Measures (CBM)
- Hiring
- Dynamic Indicators of Basic Early Literacy Skills (DIBELS)
- Facility safety
- Treatment integrity
- School improvement plans

Understand How Your System Works



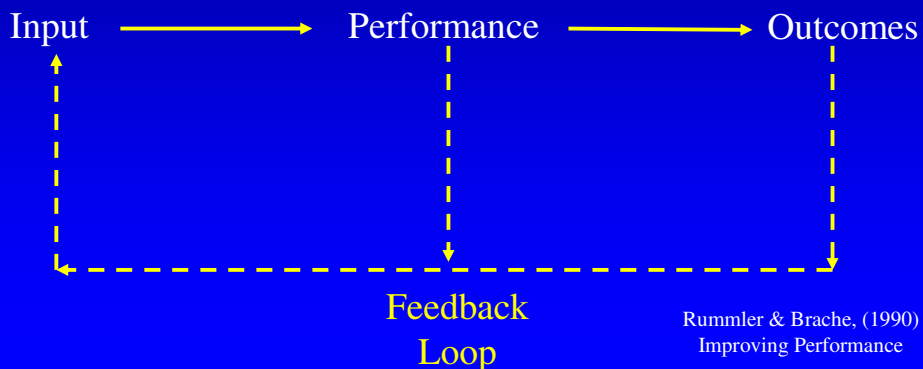
Curriculum



Teaching



Test



Part V

Building a Data-based Decision Making Culture Through Performance Management

Randy Keyworth

PART VI

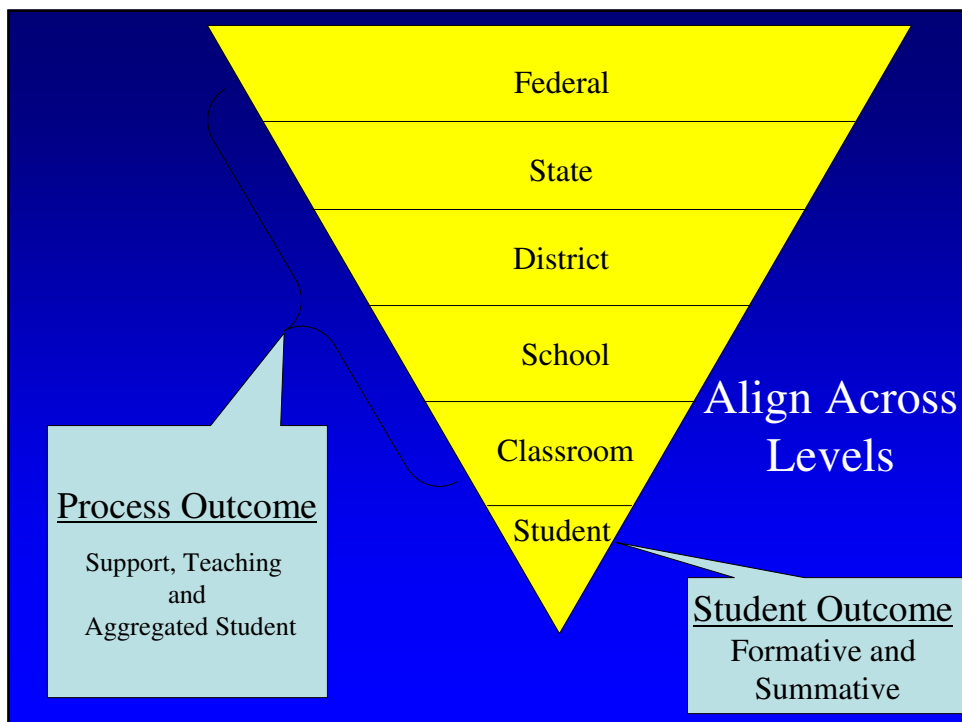
Key Indicator Systems

**“Why We Need to Systematize
Decision Making?”**

Jack States

Context is Everything

Data based decision makers are only as good as the systems in which they are working.



Key Indicator Report

What is a Key Indicator?

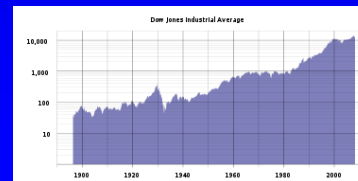
Discrete pieces of information that let us know how the system is running.

What It Does	What It Does Not Do
Identifies status or trends	But, not a diagnostic tool
Indicates system going well or poorly	But, does not identify cause
Tells you where to begin to look	But, does not prescribe solutions

Thermometer



Dow Jones

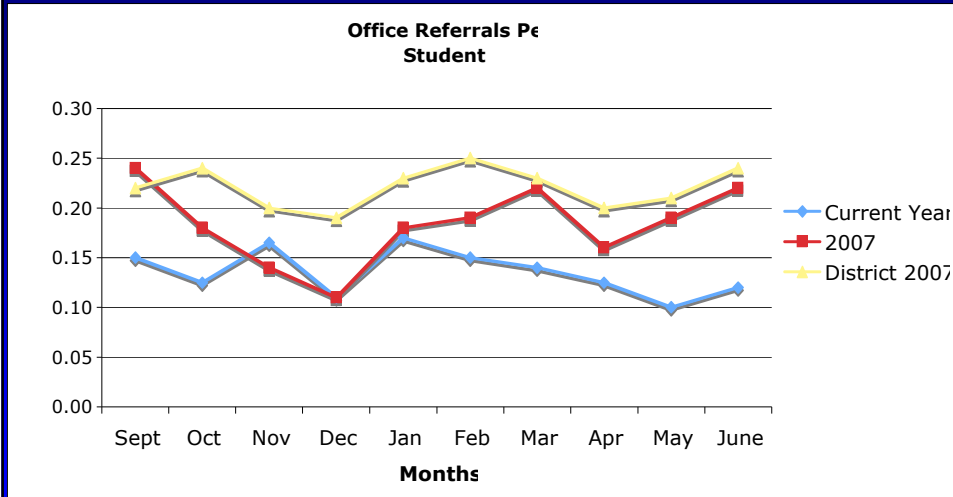


Ask the Right Questions

1. What are you going to do with the data?
2. Can the data answer the stakeholders questions?
3. Are the data an indicator of key elements (input, process, and outcomes)?
4. Are the data objective, measurable, and reliable?
5. Who needs to interact with the data?
6. Does the data drive decisions for improving the process?
7. Are the data provided timely?
8. Are the proper technologies available for storage and delivery?
9. Are the data systems capable of making queries (drill-down)

Wayman, J., Stringfield, S. & Yakimowski, M. (2004) Software Enabling School Improvement....

Create a Key Indicator Report



Indicator System Selection Criteria

Communicative Value

- Less is more: Gate keep and prune
- Utilize graphic displays
- Display simple to understand: convey complex issues but simply

Indicator System Selection Criteria

Informative Value

- Indicative of critical outcomes, process, and input
- Predictive of multiple factors
- Data can be disaggregated: Drill down

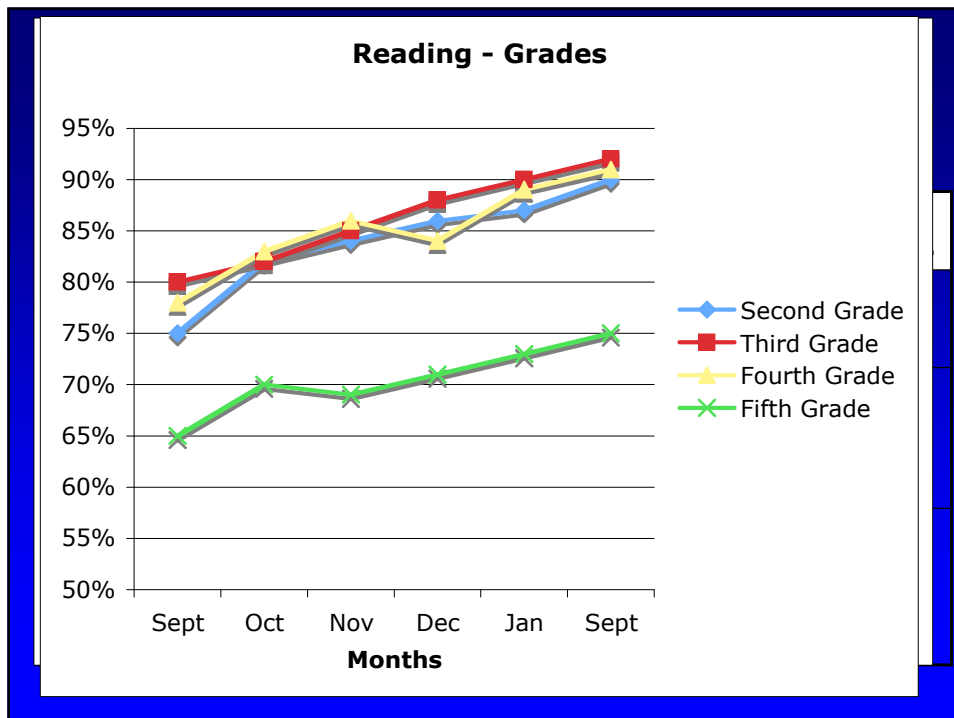
Indicator System Selection Criteria

Functional Value

- Confidence
- Timely
- Measurable
- Numerical
- Comparable
- Within available resources
- Align the data across levels

Assumption

- **Assumption:** Technology exists and is capable of supporting a Key Indicator Report
- **Current Status:** Major gaps exist in the storage and retrieval of data across data bases



Assumption

- **Assumption:** Staff have the training and time to review data and adjust teaching strategies in response to data
- **Current Status:**
 1. Teachers do not receive the technical training
 2. Formative data is frequently not input into the systems
 3. Time allotted for review of data is often not a priority

Conclusion

1. Key Indicators Reporting Systems (KIRS) can be potent tools in driving performance improvement
2. The necessary data and the technology to implement KIRS are available to school systems
3. Changes in the education culture are required to increase the time educators engage in the review of data

The End

Resources

Data Based Decisions - The Tyranny of Small Decisions:Origins, Outcomes and Proposed Solutions - (2000) Bickel, W., & Marsch, L.

Data Based Decision Model - From Data to Wisdom: Quality Improvement Strategies Supporting Large Scale Implementation of Evidence-Based Services - (2005) Daleiden & Chorpita

Data Based Decision Models - Making Sense of Data-Driven Decision Making in Education - (2006) Marsh, J., Pane J, & Hamilton, L.

Effective Dashboard Designs - http://www.slideshare.net/hursman/effective-dashboard-design-presentation?from=email&type=share_slideshow&subtype=slideshow

Key Indicators Systems - Celio,B. and Harvey, J. (2005) Buried Treasure

Performance Improvement - Rummler, G., & Brache, A., (1990) Improving Performance

Software and Hardware - Wayman, J., Stringfield, S. & Yakimowski, M. (2004) Software Enabling School Improvement Through Analysis of Student Data