OVER – THE – COUNTER DATA STANDARDS

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Standards Pages 2-13

Data system, data visualization, and data report providers need to make data "over-the-counter" – and thus easy for people to understand and use – by following Over-the-Counter Data Standards. These research-based standards concern reporting data effectively and with embedded usage support. Though originally written for the field of education, the standards can be applied in any field, as the studies that informed the standards were conducted in a variety of fields.

Research Page 14

Over-the-Counter Data Standards represent a synthesis of more than 300 studies and other sources from experts in the field. Details on work summarizing this research follows the standards on this document.

Over-the-Counter Data (OTCD) Standards

For: Data systems, visualizations, & reports that communicate important data
Purpose: Foster optimal user understanding, interpretation, & use of data viewed

Label

Just like over-the-counter medicine, data needs to be properly labeled to ensure it is used easily and appropriately. *Label* standards are organized by *Titles* and *Footers*.

1.1   Titles

Title refers to the name of a report that communicates education data. The 1.1 standards pertain to title design.

1.1.01   Present
Give each report its own, distinct title that remains consistent between (a) when it is displayed within a **report list** and (b) when it is featured directly on the **report**, in which case it should be prominent at the top of the page.

1.1.02   Communicate What Is Inside the Report
Clearly communicate what type of data the report displays and/or *how* it displays data (e.g., report type). Use a title that functions well both (a) when the report is **closed** and users are determining which report(s) to open/view in the data system, and (b) when the report is **open** (viewed within the data system or printed) and users need a quick indication of its contents.

1.1.03   Use Consistent Titling System
Utilize a consistent titling system within the data system or report suite. E.g., if one report title ends with the word "List" to indicate its format involves listing scores of multiple entities, titles of like reports should also end with "List".

1.1.04   Use Concise Language That Maximizes Info Communicated
Be concise while also communicating the *most pertinent* info a user needs to know when determining if this is the report he or she needs; i.e., do not try to accommodate all of a report's descriptors in its title. Be as concise as good sense allows; e.g., the term "3-Yr" works better than "Multi-Yr" in the title of a report that displays up to 3 years of data because "3-Yr" communicates more info while also using fewer characters (reducing clutter).

1.1.05   Leave Some Info for the Header &/or Input Controls
Do not cram ancillary info (that can be determined by users' input control selections) into the title. Instead, let users control details like "Students: Asian," "Grouped by: Course," etc. and display these selections *under* the report's title in less prominent font.

1.2   Footers

A footer is an annotation at the bottom of a data report page (though other locations can suffice) that helps the user understand and/or analyze the report's contents. The 1.2 standards pertain to footer design.

1.2.01   Present
Place a report-specific footer (as described in this section) on each data report.

1.2.02   Only Communicate Most Crucial Info
Only include info that is crucial for users to correctly understand and interpret the data. E.g., clearly communicate how users can avoid the mistakes or confusion most commonly experienced when using the report and its data.

1.2.03   Follow Length Guidelines (Short)
Establish and utilize system-wide guidelines concerning footer length that are followed with minimal (if any) exceptions, noting users are likely to ignore lengthy text. E.g., landscape/horizontally-orientated reports might have footers of up to 328 characters (including spaces), and portrait/vertically-orientated reports might have footers of up to 243 characters (including spaces).

1.2.04   Follow Font Guidelines (Same Size/Type as Report's Data)
Establish and utilize system-wide guidelines requiring the footer's font size to be the same as that used for most data in the report (resist the urge to make the footer smaller). Also use the same font *type* whenever appropriate.

Supplemental Documentation

Not all info a user needs to know can fit in the label, so supplemental documentation offers further explanation for the analysis and use of a report's data. Supplemental Documentation standards are organized by Reference Sheets and Reference Guides.

2.1   Reference Sheets

A reference sheet (often called an abstract) is a single page accompanying a report to help the user more easily understand the report and analyze its data. The 2.1 standards pertain to reference sheet design.

2.1.01   Present
Provide a reference sheet for every report, explaining that specific report. Include the sheet even for simple reports to offer users assurance/consistency.

2.1.02   Accessible
Make the sheet easily accessible with an obvious report-to-sheet **link** and with **PDF** downloading and **printing** capabilities.

2.1.03 Helpful Contents
Include helpful contents like: (a) **title** at the top of the reference sheet matching the title of the report, with the nature of the sheet ("Reference Sheet") underneath; (b) **description** of the sheet's purpose and any abbreviations used; (c) and a reduced **image** of what the report generally looks like when it has been generated (images can be "stacked" to show multiple report pages with significant differences); as well as sections for (d) "**Purpose**" (answering, "What are some questions this report will help answer?"; (e) "**Focus**" answering, "Who is the intended audience?" "What data is reported?" and "How is the data reported?" and (f) "**Warning**" answering, "What do many educators misunderstand?" in a way that helps users overcome mistakes most likely to be made when analyzing this report's data.

2.1.04 Follow Consistency Guidelines
Remain consistent in (a) **appearance** (e.g., order of info, layout, color choices, etc.) and (b) **content** type (e.g., users can expect the same types of info from each reference sheet).

2.2 Reference Guides

A reference guide (often called an interpretation guide) is a 2- or 3-page reference guide that accompanies a report in order to help the user (e.g., educator) more easily *use* the report and analyze its data. The 2.2 standards pertain to reference guide design.

2.2.01 Present
Provide a reference guide for every report, explaining that specific report. Include the guide even for simple reports to offer users assurance/consistency.

2.2.02 Accessible
Make the guide easily accessible with an obvious report-to-guide **link** and with **PDF** downloading and **printing** capabilities.

2.2.03 Helpful Contents
Include helpful sections like: (a) **reference sheet** (as described in Standard 2.1.03) as the reference guide's 1st page, followed by sections for (b) "**Instructions**" answering/illustrating, "How do I read the report?"; (c) "**Essential Questions**" answering/illustrating each question listed under "Purpose: What are some questions…" on the guide's 1st page; and (d) "**More Info**" answering questions that lead users to additional info on related topics.

2.2.04 Follow Consistency Guidelines
Remain consistent in (a) **appearance** (e.g., order of info, layout, color choices, etc.) and (b) **content** type (e.g., users can expect the same types of info from each reference guide).

Help System

An online help system, accessible via link from the data system, contains lessons to help users perform tasks and understand topics. *Help System* standards are organized by *Tech Lessons* and *Data Analysis Lessons*.

3.1   Tech Lessons (Using the System)

Tech lessons help users to use the data system (e.g., what to click, where to look, etc.), acting like a virtual tech coach/trainer who can assist users when a live person who can help is not present, Customer Support is closed, and/or this training tool is desired. The 2.2 standards pertain to tech lesson design.

3.1.01   Present
Offer a comprehensive set of tech lessons to cover all common technical tasks and key technical topics.

3.1.02   Accessible
Make lessons: (a) accessible **online** (e.g., users can share a lesson's URL with other users, Customer Support can share a lesson's URL with a user asking for help, etc.), (b) logically **organized** so they are easy to manually locate within the help system, (c) **searchable** (e.g., users can enter a term like "generate report" within the help system and links to relevant lessons will appear), (d) with **PDF** downloading and **printing** capabilities, and (e) (in addition to the ever-present help system link) place a specific **lesson link**/button in each pertinent data system area (e.g., in the part of the system where users create custom reports, offer a link directly to the "Create Custom Report" lesson).

3.1.03   Include Lessons for All Users
Include lessons to meet all users' needs, remembering even "intuitive" systems and processes are not intuitive to users lacking tech-familiarity. E.g., some users will need a lesson on how to log into the data system.

3.1.04   Key Features
Make lessons: (a) **task-specific** (e.g., do not cram a single lesson with everything users might want to do in a module), with few **topic-specific** exceptions; (b) **step-by-step** (e.g., "1. Click *Search* in the top-right corner of your screen…"); and (c) **illustrated** (e.g., show what the relevant portion of the screen looks like during each lesson segment, with numbers superimposed on the image to match numbered steps explained in the lesson, etc.).

3.1.05   Follow Consistency Guidelines
Remain consistent in (a) **appearance** (e.g., order of info, layout, color choices, etc.) and (b) **content** type (e.g., users can expect the same types of info from each of the same types of lessons).

3.2   Data Analysis Lessons

Data analysis lessons help users to understand, analyze, and use data in the system (e.g., "Understand State Accountability Measures"), acting like a virtual data coach/trainer who can assist users when a live person who can help is not present, Customer Support is closed, and/or this training tool is desired. The 3.2 standards pertain to data lesson design.

3.2.01   Present
Offer a comprehensive set of data analysis lessons to cover all common data-related tasks and key data-related topics.

3.2.02   Accessible
Make lessons: (a) accessible **online** (e.g., users can share a lesson's URL with other users, Customer Support can share a lesson's URL with a user asking for help, etc.), (b) logically **organized** so they are easy to manually locate within the help system, (c) **searchable** (e.g., users can enter a term like "data dialogues" within the help system and links to relevant lessons will appear), (d) with **PDF** downloading and **printing** capabilities, and (e) (in addition to the ever-present help system link) place a specific **lesson link**/button in each pertinent data system area (e.g., in the part of the system where users customize intervention tiers, offer a link directly to the "Use Intervention Tiers" lesson).

3.2.03   Include Lessons for All Users
Include lessons to meet all users' needs, remembering users vary greatly in data skills and comfort levels. E.g., some users will need introductory lessons with definitions of common terms.

3.2.04   Key Features
Make lessons: (a) **topic-specific** (e.g., do not cram a single lesson with everything users might want to do with data), with some **task-specific** exceptions (e.g., "Use Results to Differentiate Instruction"); (b) **region-specific** (e.g., as concerns specific assessments and their guidelines); and (c) **illustrated** (e.g., diagrams, classroom layouts, etc.).

3.2.05   Follow Consistency Guidelines
Remain consistent in (a) **appearance** (e.g., order of info, layout, color choices, etc.) and (b) **content** type (e.g., users can expect the same types of info from each of the same types of lessons).

Package/Display

The manner in which data is packaged and displayed for users needs to promote easy and accurate understanding/analysis/use of the data. *Package/Display* standards are organized by *Credibility*, *Key Features*, *Design*, *Navigation*, and *Input Controls*.

4.1 Credibility

A credible data system or report suite is one users can trust as accurate and appropriate. The 4.1 standards pertain to ways data systems and reports must establish and maintain credibility.

4.1.01 No Wrong Data
Safeguard against displaying incorrect data. E.g., ensure: (a) **reports work** properly (e.g., do not "duplicate-count" or erroneously convert a numeric score to a percent); (b) reports pull data from the **right places**; (c) original **data files** are as appropriately formatted, clean/correct, and complete as possible.

4.1.02 No Inappropriate Displays or Calculations
When determining how to display data and how to calculate values: (a) adhere to guidelines **specific to the data** being displayed (e.g., do not show accountability scores over time on a line graph, implying growth, if those particular accountability scores cannot be used to determine growth) or calculated (e.g., do not subtract one grade level's test score from another's and emphasize the difference if that particular test is not scaled across grade levels), (b) select displays and calculations most likely to **encourage correct** analyses of the particular data being displayed, and (c) do **not simplify** the data presentation to the point that misunderstandings are likely.

4.1.03 No Sloppiness
Ensure the data system and its reports contain no: (a) **misspellings**, (b) errors in **grammar** or **capitalization** (including tags for case-sensitive searching), (c) unintentional **font** changes (in type, style, or size), (d) **cut-off** text (e.g., due to cell or page limitations), (e) sloppy **formatting** (lines missing or overlapping, inconsistent spacing between graphs, varied row height for no reason, etc.), or (f) inflexibility to **variations** (e.g., graph bar colors do not adhere to intended colors/meanings if an assessment has fewer proficiency levels than usual).

4.1.04 Private & Secure
Conform to best practices and legislation for data privacy and security.

4.2 Key Features

Key package/display features refer to components that can be seen within data reports. The 4.2 standards pertain to key feature design.

4.2.01 Summaries/Averages for Comparison

Include the summaries/averages that will best provide context for the types of comparisons users will want to make when they use the report (this requires understanding the report's purpose and use). E.g., a class list of 35 students' scores will likely require a "Class" row averaging each column's data.

4.2.02 Calculations Done for You

Provide calculations that prevent users from having to perform mental arithmetic when analyzing data (e.g., if displaying performance over multiple years on a vertically-scaled assessment, display any appropriate, relevant growth calculations). Note calculations can also result in words rather than numbers, such as a proficiency determination.

4.2.03 Vital Data Included

Display all data required for a report to function most effectively. Do not require users to look elsewhere to acquire data a user needs (a) to **properly** use the report or (b) for the report to achieve its intended **purpose** (e.g., if users must hover or click to "drill down" to added info, that added info must not be essential to the report's primary purpose).

4.2.04 Graph as Appropriate

Include graph(s) when appropriate while adhering to graph guidelines such as: (a) use graphs **only for key info/comparisons** (e.g., use graphs to point out important occurrences – such as trends – that are easily missed in a table, but do not graph all available data), (b) select graph type based on **ease** of use and its **suitability** to the graph's purpose, (c) include **0 on the scale** of an axis (rather than narrowing its displayed range) and make the scale read from **left to right** (e.g., scales on a horizontal, such as a table's row of column headers, should begin with the lowest value in the leftmost location and end with the highest values in the rightmost location), (d) use **2-dimensional** (not 3-D) graphs, (e) place **data directly on** the graph (e.g., if a bar represents 36% of students, display "36%" above the bar), and (f) **consider # of entities** (e.g., if 78 schools would each appear as bars on a graph, rendering the graph cluttered and ineffective, default to a modified display).

4.2.05 Clear Headers

Use headers (e.g., cells that top report columns and start rows) that: (a) **provide added info** to prevent user confusion or the need to look elsewhere to understand the data's nature, (b) **distinguish/group data** (e.g., when there are varied categories of data columns, such as 3 columns of data for one test and 3 columns of data for another, use multiple header rows to clarify demarcations and reduce text repetition), (c) **avoid all caps** (only use all capital letters if absolutely necessary to help distinguish some headers from others), and (d) **repeat when printed** (column headings should repeat at the top of each subsequent page when a table continues on multiple printed pages, just as main page header info should repeat and be included with page numbers).

4.3 Design

Package/display design refers to how each report looks (e.g., is arranged) on the screen and page. The 4.3 standards pertain to report display decisions.

4.3.01 Format/Components Most Appropriate for Analysis

Select the format and components most likely to encourage accurate understanding/analysis/use of the data. E.g., you might opt to use a table to communicate large amounts of data a report requires, but particular columns within the table can contain horizontal graph bars to highlight important data.

4.3.02 Avoid Clutter

Avoid unnecessary clutter, following guidelines such as: (a) **do not outline** bars/wedges if perimeters can survive bad printers (e.g., do not add a black line around a graph's red bar if the red is dark enough to be seen when printed on an old black & white printer), (b) **use lines sparingly** and purposefully (e.g., to distinguish sections of data rather than outlining every cell in a table), (c) include **white space** to make the report easy to understand (but not so much that it adds to excessive report pages when printed), (d) **round numbers that will not lose distinctions** (i.e., round all numbers to the whole *unless* you are dealing with small numbers for which distinctions will be lost without decimals, such as averages of performance levels ranging from just 1-5; when an extra place value is warranted, limit the decimals to 1 if effective), (e) **show data and eliminate other clutter** (i.e., if added data will give a report more meaning, add the data and select *other* clutter to eliminate), (f) **avoid unnecessary text/columns/rows** (e.g., if adding a table column with the calculation of performance level data comprising *% Proficient*, there is typically no need to add a column for the calculation of performance level data comprising *% Not Proficient*), and (g) **not everything experts ask for** has to be included (there are too many "recommended" additions for reports to accommodate; consider each addition against the importance of avoiding report clutter).

4.3.03 Avoid Keys/Legends

Work content into a chart's title or labels (e.g., directly within or beside graph segments such as bars or lines) to avoid a key or legend whenever possible. If legend inclusion is unavoidable, keep the order of colors/explanations in the key consistent with the order in which segments are presented in the graph.

4.3.04 Most Important Data in Prime Locations

Place the report's most important data in places likely to stand out (e.g., not lost in a table's middle columns). Treat the last column or row in a table as prime real estate, reserved for data users are most likely to need. Treat the first row and column (which come after the header row and column) as slightly less prime (but more desirable than middle columns) if additional data needs to stand out. Likewise, reserve any culminating graphics or sections for those communicating key info.

4.3.05 Juxtapose Comparisons
Offer **reports that juxtapose** multiple subgroups, other entities, years/times, or measures for easy comparison (i.e., users should not have to run separate reports to make common comparisons). Use **proximity within reports** when placing data that will need to be compared.

4.3.06 Eye Can Scan without Obstacles
Allow the user's eye to move across a report or section without encountering visual obstacles that impede common comparisons. E.g., if accompanying a table's primary data (like rows for "% of students" earning each column's performance level) with secondary data (like rows for "# of students" earning each column's performance level), give secondary data a smaller font so it is easy to ignore or compare separately when the eye scans the page.

4.3.07 Do Not Hug Lines
With few exceptions (such as widely-varying figures), center or indent data horizontally within cells and center data vertically within cells rather than justifying data directly against cell borders.

4.3.08 Purposeful Color & Shading
Use color and shading purposefully and selectively (a) as an additional layer of **communication** (e.g., bars of graphed scores can be green vs. red to visually communicate if the scores rendered *Proficient* vs. *Not Proficient* status) and (b) to help **organize** a report (e.g., report section headings can be shaded to stand out and better differentiate sections).

4.3.09 Size Reflects Importance
If there are any required variations in size (e.g., font size), make sure it is appropriate for users to deem the reduced-size info as less important.

4.3.10 Not Unnecessarily Complicated or Overly Simplified
Do not make a report more complicated than it needs to be *or* more simple than it has to be. E.g., use (a) a **simple-yet-effective display** (e.g., do not simplify the data presentation to the point that it is misunderstood or less effective) and (b) use **simple language** and avoid jargon (e.g., use # *tested* rather than *n*, *average* rather than *mean*, *growth* or *improvement* rather than *gain score*, *most frequent score* rather than *mode*, etc.).

4.4   Navigation

Navigation refers to the manner and ease with which users are able to use and move through the data system. The 4.4 standards pertain to navigation design.

4.4.01   Easy & Fast
Facilitate easy (e.g., logical arrangement) and fast/efficient (e.g., few clicks) use and movement within the system, remembering users' tech-familiarity varies.

4.4.02   Efficient Filters for Finding Reports
Provide filters users can select to narrow the list of available reports relevant to their needs. Provide filters that: (a) cover **major search needs** varied users are likely to have, (b) do **not cover minor search needs** (reserve this for open-ended searching), (c) utilize proper capitalization (for appearance) but do **not operate on a case-sensitive** basis (e.g., a lowercase search can lead to uppercase-tagged reports), (d) allow for **multiple tags per report** (tags are report-tied terms by which filters operate) and the ability to use multiple filters, (e) are displayed in clear, logical **categories** when users are viewing and selecting filters, and (f) are **region-specific** (to match the user's tests, etc.).

4.4.03   Consolidate Reports to Support Multiple Inquiries
Consolidate like reports into a single report (which can then be customized by the user with input controls, e.g., selecting a particular test) whenever possible.

4.4.04   Design Consistency
Remain as consistent as possible from one report to the next in terms of design as long as the design remains well-suited to the data's appropriate analysis.

4.5   Input Controls

Input controls provide users with options (e.g., via drop-down menus) to customize how a report is generated, which allows the same report to serve multiple functions. The 4.5 standards pertain to input control design.

4.5.01   Facilitate Recommended Data Investigation Practices
Offer input controls that facilitate data investigation practices that are recommended for users. E.g., allow users to open a single report and use its input controls to easily change the measure being viewed, rather than requiring users to select a test-specific report and then return to the report list to find and select another test-specific report in order to investigate multiple measures.

4.5.02   Required Controls Are Visible
If "hiding" some input controls (e.g., to not overwhelm users), do not hide any controls required for the report to generate.

4.5.03   Grey-out Unavailable Options & Leave out Never-Available Options
Grey-out unavailable options (e.g., any options for which there *can be* data but there is *not* data are still listed, but in a lighter/grey font). Do not display options that are never available for particular parameters (e.g., grade levels that are not taught at a particular site).

4.5.04   Categorized Control Display
Display/group input controls by category (e.g., by *Scope*, *Test*, and *Students*).

4.5.05   Time-Saving Options
Offer time-saving options such as: (a) easy **disaggregation** of data, (b) easy **aggregation** [e.g., among single grade level options, let users opt to select *All Tested (combined)* for *Grade Level* to generate a single report in which all grade levels' results are consolidated/summarized], (c) **run multiple reports at once** [e.g., let users opt to select *Each Tested (separate)* for *Grade Level* to generate a separate report for each grade level within a single generation so the user does not have to run each report separately], (d) data **source options** (e.g., using state/official data source files vs. the data system's local/roster-based data), and (e) **multi-select** (e.g., let users opt to select multiple options simultaneously on a single drop-down menu).

Content

Just as over-the-counter products must contain effective and unexpired ingredients to function well, the contents of data systems and reports must be effective and timely. Content standards are organized by Each Report and Report Suite.

5.1   Each Report

Each Report refers to the content of each report in a data system or report suite. The 5.1 standards pertain to report content considerations.

5.1.01   Expiration
Keep report contents current, e.g., with changing: (a) **legislation** (e.g., accountability requirements, retention criteria, terminology used, etc.), (b) **user needs** (e.g., growing term familiarity), (c) **research** developments such as those concerning users' data needs (e.g., new approaches to data use), and (d) **technology** developments (e.g., if users cannot "drill-down" or download to manipulation-friendly formats when needed, the report environment is dated).

5.1.02   Audience Appropriate
Cater design contents to the report's pre-determined audience(s) in terms of its: (a) **knowledge and skills** (e.g., terms and explanations), (b) **role** and how it will use the report (e.g., components included vs. excluded), and (c) **region** (e.g., format that best accommodates an assessment's reporting guidelines).

5.2   Report Suite

Report Suite refers to the collection of reports within the data system or other reporting environment, and it concerns how the suite of reports functions as a whole. The 5.2 standards pertain to report suite considerations.

5.2.01   Expiration
Keep the report suite current, e.g., with changing: (a) **legislation** (e.g., reports addressing new forms of accountability), (b) **user needs** (e.g., sync with new edtech), (c) **research** developments such as those concerning users' data needs (e.g., the system is dated if every user does not have access to timely data or if no reports are predictive or show progress over time), and (d) **technology** developments (e.g., the system is dated if students are not tied to unique identifiers; or if users cannot create custom reports without query-writing knowledge; or if data is not appropriately collected, stored, and protected).

5.2.02   Proactive Design Approach
Utilize a predominantly **proactive** (rather than reactive) design model for report development and maintenance where the core suite of reports is **preplanned** in a **centralized** fashion (e.g., someone with an education/data/design background should lead the project, solicit feedback, etc.).

5.2.03   Not Too Many
Do not offer so many separate reports that the report list is overwhelming and individual reports are hard to find. Instead, plan a report suite that is efficient. E.g., each report should accommodate multiple variables as options (such as an input control with multiple measures) and each report's topic should address multiple theories and questions (which can be infinite).

**5.2.04   Organized to Cover Needs Matrix**
Offer a suite of reports that, as a whole, meets users' key data needs (as organized within a comprehensive needs matrix) in a way that is user-friendly and unintimidating. E.g., the suite: (a) has **no gaps** (gaps occur when key analyses are not facilitated by any of a data system's reports, or when key analyses can only be accommodated when data system reports and/or features not intended for those analyses have to be used in a cumbersome way because no better alternatives exist in the data system), (b) is **topic-focused** (whereas theories and questions are infinite), and (c) is **region-specific**.


More Information

Evidence supporting each Over-the-Counter Data (OTCD) Standard is featured in the book ***Standards for Reporting Data to Educators: What Educational Leaders Should Know and Demand***, by Dr. Jenny Grant Rankin, published by Routledge/Taylor & Francis (2016). This book summarizes over 300 studies and other expert sources concerning how data should best be displayed.

This book is best for people who want to examine the research behind each standard (e.g., researchers). This book was written with education data in mind, but the studies come from varied fields and the text can be applied to any field.
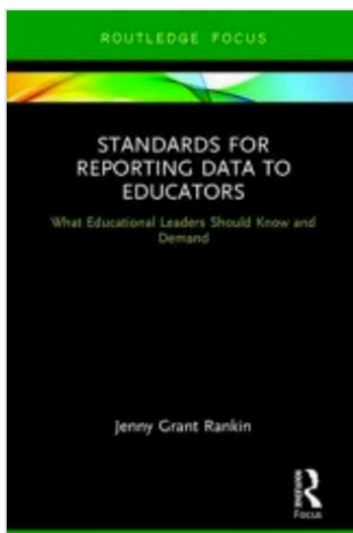
Evidence of the importance of OTCD Standards and guidance in advocating for effective data reporting is featured in the book ***How to Make Data Work: A Guide for Educational Leaders***, by Dr. Jenny Grant Rankin, published by Routledge/Taylor & Francis (2016). This book also covers how to best support data users (e.g., professional development) and maintain a healthy data use climate.

This book is best for educator leaders who guide and support other educators in using data (e.g., school and district administrators, department/grade leads, data/instructional coaches, etc.) and for data-using educators.
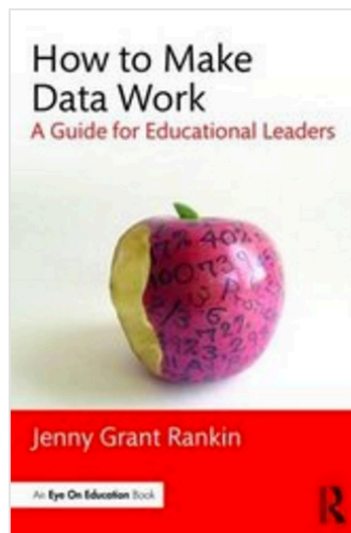
Evidence of the importance of OTCD Standards and guidance in how to best design data reports/displays and related docs is featured in the book ***Designing Data Reports that Work: A Guide for Creating Data Systems in Schools and Districts***, by Dr. Jenny Grant Rankin, published by Routledge/Taylor & Francis (2016). This book provides detailed, illustrated direction in how to best communicate data.

This book is best for people who design data visualizations, data reports, or data systems that will be used by others. Though this book was written with educator users in mind, it can be applied to data displays in any field.