THE OPTIMAL REFERENCE GUIDE

Want to Buy a Used Dashboard? Definitely!

Insights into Designing High-Usage Education Dashboards

Extraordinary insight™ into today's education information topics

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Introduction

dash·board

ˈdaSHbôrd/
Noun

> 1.
> the panel facing the driver of a vehicle or the pilot of an aircraft, containing instruments and controls.

> 2.
> historical
> a board of wood or leather in front of a carriage, to keep out mud.

in·stru·ment

ˈinstrəmənt/
Noun

> 1.
> a tool or implement, especially one for delicate or scientific work.
> "a surgical instrument"

> 2.
> a measuring device used to gauge the level, position, speed, etc., of something, especially a motor vehicle or aircraft.

Definitely, we would want to buy a dashboard that is used. In fact, the quest we set out upon when we started this paper was to discover all the ways developers of education dashboards have employed to maximize their use. As ESP has expanded our development of dashboards for our clients, we are committed to deliver not only websites that are functionally excellent, but also frequently visited and depended upon by the intended users.

Education data dashboards on the Web share little with their historical namesakes, mud catchers on horse-drawn carriages. (Maybe just a little.)   More should be in common with the dashboards on planes and automobiles. Those contain instruments and controls. Instruments and controls imply an active relationship with the user. As the data on the plane's or automobile's dashboard changes in real time, the user decides the appropriate action to take. In fact, when the users of an automobile or aircraft dashboard look at a dashboard, they are in an action mode. The data they are viewing are of immediate use. Those data are informing pending actions.

That's the goal of our education dashboards.

When ESP began building web reports years ago, they weren't referred to as dashboards. Early on, some of us even resisted using the term dashboard because it undervalued the richness of the data being presented. Of course, today, dashboards in automobiles are computer monitors with GPS, calculation of driving ranges, back-up cameras, and even parallel parking assistants. Our education dashboards should hope to be so helpful.

In this paper, we begin to compile lessons learned about dashboards. Our hope was that we would discover what research has shown ensures effective usage of a dashboard. As ESP continues to implement dashboards for our clients, we wanted to know how to ensure successful usage by teachers,

school staff, district personnel, state program officers, policy makers at all levels, and, as appropriate the students, parents, and public. This is not the final paper. We have dashboard projects on-going that continue to provide insights.

Insights

If a website presents accountability data such as mandated by the No Child Left Behind Act of 2001, it is intended to be action provoking—school improvement. A display of official statistics, even with historical comparisons, isn't much of an action dashboard. Why? As this paper will differentiate, those reference websites likely aren't active partners with the users managing, fresh data to inform decisions and actions. Even the accountability websites are annually refreshed.
As a starting point, here's a possible classification for education dashboards.

> **Reaction Dashboards:** As the reader views data, immediate decisions are made and actions are taken.

> **Action Dashboards:** The reader uses the data from the dashboard to make timely decisions to determine actions.

> **Information Dashboards:** The reader obtains information from the dashboard.

> **Documentation Dashboards:** The dashboard creator's purpose is to have a place to publish documentation and information.

> **Communication Dashboards:** The dashboard is a facilitator of and location for communications within a community of interest.

We reviewed what literature is available, a publication about an Ed-Fi dashboard project, and the writings of an acknowledged guru of dashboards (Few). We also interviewed our own content experts who have considerable experience with education data systems, analytics, reporting, visualizations, and training users.

From this, seven over-arching insights have been summarized. Under each, we have listed the individual findings that relate to it. Again, this is not a final product yet. We are continually seeking additional insights and improvements to these.

Dashboard Insight #1   Effective dashboards are active partners with the users, doing work for them, saving time, and organizing data in a timely visualization that makes a decision easier about action to take.

Dashboard Insight #2   Effective dashboards present timely and quality data upon which users can and regularly depend.

Dashboard Insight #3   Effective dashboards are designed from the users' questions and related actions.

Dashboard Insight #4   Effective dashboards are designed and developed by content experts with years of experience with education agency clients. These experts guide the design and development of valid metrics, business rules, policies, processes, and other parameters for the dashboards.

Dashboard Insight #5   Effective dashboards are developed following project management processes reflective of the education context as well as the specific demands of a dashboard project.

Dashboard Insight #6   Effective dashboards have sustainability ensured by knowledge transfer to the users and agency by the expert design and development team.

Dashboard Insight #7   Effective dashboards use the principles developed by experts such as Few and Tufte for visualizations and dashboard presentation and utilization.

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Insights into Designing High-Usage Education Dashboards

Dashboard Insight #1   Effective dashboards are active partners with the users, doing work for them, saving time, and organizing data in a timely visualization that makes a decision easier about action to take.

Effective Dashboards:

a. Do work for the user, save time, bring data together in one place, make comparisons, do calculations, or otherwise perform a function that the user would not be able to do without them. (1)

b. Provide value and efficiency; and the ability for rapid monitoring, quick examination, and understanding. (1)

c. Are intuitive and easily understood. Their use is clear and without distraction. (1)

d. Provide an environment where the user doesn't need to leave. The dashboard provides launch pad capability, where the user has access to all required processes. For instance if an issue is encountered the user can provide feedback, report findings, and take necessary action. (1 and 2)

e. Provide direct access to required additional information and provide access to the required process for response. This includes the ability to send an automated response or email to those that need to take action. (2)

f. Do something for the user, e.g., rearrange information, calculate statistics, combine data from disparate sources, complete a report, or keep records. If the dashboard doesn't perform some work for the user, then it is just more data overload. Being an assistant makes the dashboard necessary, dependable, reliable, more efficient to use than to ignore. (1)

g. Make a comparison with another meaningful entity that the user couldn't do alone—other classes, schools, districts, states, nations, subgroups. The comparison needs to be for a purpose. The dashboard needs to respond to a question that the user needs answered.(1)

h. Provide lists to people. People want a list of kids/teachers/parents/etc. meeting specific criteria. This saves the user work and time. Example: List the students who need help mastering math objective 7 for the state assessment. Alert the user to "opportunities." When a new student enrolls, the family information can be presented to the principal. (1)

i. Send the teacher or principal:
    1. Alerts,
    2. Reminders,
    3. Scheduled tasks,
    4. Notices when data are updated, or
    5. Notices user has been inactive for n days. (1)

Dashboard Insight #2   Effective dashboards present timely and quality data upon which users can and regularly depend.

Effective Dashboards:

a.   Present data that change regularly and get updated frequently. (1)

b.   Provide reference materials that are complex, exact, or official and need to be referenced accurately. (1)

c.   Are updated regularly so they become part of a routine for which the users keep coming back. If the dashboard changes too seldom, the user forges to use it. There is no habit formed. The dashboard needs to become part of the user's routine. (1)

d.   Are designed with data refresh frequency expectations that the users can depend upon. (3)

e.   Are only effective if they are kept current – Keep them current or don't bother. (4)

f.   Follow the WYSIWYG paradigm: What you see is what you gave by reflecting the data that users and their systems report. There will be nothing better or more current than what is provided. If one enters something wrong, or has not data entered, then the dashboard will be inaccurate. (1)

g.   Reflect accurately what is recorded in the student information system (SIS). For example, if a high school student was enrolled as a 4th grader, then the dashboard is going to show the student in 4th grade until the error is corrected in the SIS. (1)

h.   Provide complete and correct data relationships. If the data are incomplete or incorrect they cannot be loaded because there may be orphaned data if the natural keys are changed. (1)

Dashboard Insight #3   Effective dashboards are designed from the users' questions and related actions.

Effective Dashboards:

a.   Are evaluated for effectiveness from the users' experience and feedback. (1)

b.   Are designed with focus and advisory group input. (1)

c.   Are developed utilizing pilot organizations and phased rollouts to manage design, stakeholder experience, promotion of the dashboard product, scope, implementation, training, and usage. (1)

d.   Are developed by listening to users for feedback. In one project, we initially used ZIP codes instead of NCES geo-codes to display district boundaries. We learned from our clients that geo-codes visualized more detailed district boundaries. (1)

e. Utilize dashboard usage metadata as a key performance indicator. Visits by individual users, number of page views, and other measures can be both employee incentives and dashboard improvement metrics. (1)

f. Use traffic data for a contest and acknowledge users with the most visits. A dashboard can be created to show usage by department, individual, group, etc. (1)

g. Communicate changes, new data, newsletters, updates. Constant communications by managers that details data refresh, new dashboards, FAQs. (1)

h. Utilize online community forums where users can communicate. (1)

i. Leverage evaluation tools for feedback – surveys, forums, advisory groups and focus groups (1)

j. Leverage stakeholder engagement as a critical component to the success of the pilot roll-out and statewide adoption of the Ed-Fi dashboard project. (6)

k. Ensure stakeholders understand the project vision, review the project's progress, and are able to provide input into the design of the dashboard. (6)

l. Establish commitment and support around the dashboard project with the expectation that all stakeholders champion the dashboard project. (6)

m. Identify the features that give pilot districts the most functionality while balancing the needs for the entire state/entity. (6)

n. Allow stakeholders to constantly weigh the ever changing landscape of the educational space including district policies, standards, key success indicators, and assessments when determining what to include in future implementations. (6)

o. Provide ongoing stakeholder engagement and can include methods such as surveys to understand the changing needs of all districts across the state. (6)

p. Obtain user feedback directly through the dashboard, and utilize the data to understand the need for possible future dashboard enhancements. (6)

q. Ensure that expectations are at the forefront of every discussion, are clearly set, and continuously communicated to all stakeholders, including, but not limited to the long-term vision of the project and the phased rollout approach. (6)

r. Are aware of the audience and understand who will use the dashboard. Whether it is for a single person, a single group, or people in several different departments? (3)

s. Are aware of what the dashboard will be used for, what questions it needs to answer, and what actions users will take in response to these answers. (3)

t. Provide the "right context for the key measures" so that it is clear what has changed and what action must be taken. (2)

u. Ask which data are the key (i.e., most important) items needed to meet the objectives supported by the dashboard? (3)

v. Understand the useful comparisons that will allow the dashboard's users to see the data items listed above in context. For instance, if one of the measures that your dashboard displays is revenue, do you have targets or historical data that could also be displayed to make current revenue more meaningful? (3)

w. Choose metrics based on why they matter (4)

x. Match metrics to goals. (4)

Dashboard Insight #4   Effective dashboards are designed and developed by content experts with years of experience with education agency clients. These experts guide the design and development of valid metrics, business rules, policies, processes, and other parameters for the dashboards.

Effective Dashboard Designers:

a. Provide meaningful metrics that relate to the question, as opposed to solutions looking for problems. (1)

b. Use metrics that people will understand. (4)

c. Understand the lack of accommodation of Grading Cycles is not in Ed-Fi Core—There is a limitation in the way Ed-Fi accommodates grading terms. Currently only 6 or 9-week terms are accommodated in Ed-Fi. With each project ESP needs to determine if the Grading Cycle terms are an issue and address them immediately. (1)

d. Are FERPA aware—restricting which students are accessible by an individual. (1)

e. Are aware and compliant with the data governance and policy control for stickiness of the data. For instance how long will the data be displayed and will longitudinal comparisons be made in the dashboards? (1)

f. Reflect a unique understanding of state departments of education. For instance the use of real-time data for state reporting requires the insertion of a stricter set of business rules to ensure the data collected can be "official." (1)

g. Are aware of the natural tension between the speed with which state agencies can collect and disseminate data and the degree to which they impose business rules to validate data with the intension of improving the data quality. Our experience with SRM is that district data managers often spend weeks working through validation issues in order to get state reports prepared for federal reporting. Teachers and administrators have limited interest in what happened in their classroom weeks ago. They require feedback that is as close to immediate as possible. Any state agency that wants to provide services to LEAs must

understand and accommodate this issue. ESP has created a validation platform which can be scaled to provide more or less detailed validation support depending on these requirements. (1)

h. Are aware of the need for data discovery and documentation, have knowledge of state data and related code values, and provide a head start via their understanding of state education data. (1)

i. Understand the use of aggregate and individual data in dashboard. These are two very distinct uses of dashboard data. For instance ED*Facts* is strictly aggregate. (1)

j. Apply small *n* rules to apply confidentiality protection so that students cannot be identified. With individual data it can only be linked to specific users with permission due to confidentiality. (1)

k. Understand the complexity of different demographics, programs, qualifications of staff via longitudinal and/or cohorts. Growth Model analysis. (1)

l. Understand the difference of students with a full academic year versus coming into a school the day before an assessment. (1)

m. Ask if individual schools or LEAs have the decision to display individual dashboards or domains (1)

Dashboard Insight #5 Effective dashboards are developed following project management processes reflective of the education context as well as the specific demands of a dashboard project.

Effective Project Management for Dashboard Development:

a. Utilizes statements of work and agreed-upon project milestones in order to set a framework for scope management. (1)

b. Is developed with the understanding that there is no such thing as a generic dashboard implementation. Each project site and environment has its own unique needs, expectations, and integration tasks. (1)

c. Understands that constant ongoing communications are the key to project success throughout the project lifecycle. (1)

d. Is aware of the importance of Amazon Web Service (AWS) infrastructure and how to use it. AWS is a continuous integration and build process that ESP has determined must be used in Ed-Fi dashboard implementations. (1)

e. Understands the importance of utilizing project pilots and phases. A standard process of ESP's Quality Project Management is to work closely initially with a handful of early adopters and plan for a phased rollout implementation. (1)

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f. Understands that identity management is key. Passing sign-ins accurately and effectively to the dashboards is essential for security and efficiency. (1)

g. Stays in frequent communication with the Ed-Fi Alliance and Ed-Fi community to best understand what new features have been upgraded to Ed-Fi core and the enhancements that members are working on in order to leverage new development and prevent duplication of efforts. (6)

h. Leverages external relationships in order to ensure that the project is financially sustainable. (6)

i. Partners with key data source vendors, including SIS and assessment vendors, to minimize long-term costs associated with building, supporting, and maintaining dashboard upgrades. (1 and 6)

j. Collaborates with the Ed-Fi Alliance and community to help encourage data source vendors to support and adopt Ed-Fi standards. (6)

k. Does not wait for newer, more complex technology and large scale BI deployment projects to get started. Technology is always changing. There is no need to wait for the next best technology to get started. (4)

l. Does not underestimate the time or resources that are needed to create and maintain the dashboard. (4)

Dashboard Insight #6 Effective dashboards have sustainability ensured by knowledge transfer to the users and agency by the expert design and development team.

Effective Dashboard User Support:

a. Utilizes focus groups, advisory groups, and pilots; and understands that phased rollouts are key to managing design, stakeholder experience, stakeholder promotion of the dashboard project, scope, implementation, training, and usage. (1)

b. Realizes that the key to success is communications throughout the project.

c. Increases project efficiency by utilizing train-the-trainer methodology and videos. (1)

d. Understands the role of training in usage. (1)

e. Focuses training on use of the data, how to solve problems that are found in the data, and how to apply knowledge gained from dashboards. Training should not be focused on the technology, but on implementation of policy and what to do with the data. (1)

f. Has user guides that provide high-level explanations of what is in the dashboard, why we are doing this, and who has access to which data? They are not intended to train on the navigation of the dashboard as the dashboard is expected to be intuitive. (1)

g. Provides user guides that address confidentiality, where the data originate, and where to direct problems. This process empowers users to provide feedback on design, data, and usage. (1)

Dashboard Insight #7   Effective dashboards use the principles developed by experts such as Few and Tufte for visualizations and dashboard presentation and utilization.

Effective Dashboard Visualizations:

a. Are intuitive enough to not require dashboard navigation training. (1)

b. Are intuitive and use is clear and without distraction. There is clarity as to what action needs to be taken. (1 and 2)

c. Are visual and interactive. (4)

d. Are simple to access and use. (4)

e. Avoid too much complexity. (4)

f. Avoid cluttering the dashboard with unimportant graphics and unintelligible widgets. (4)

g. Are aligned with the following principles of Few and Tufte for visualizations and dashboard presentation. Effective visualizations:

   i. Utilize both graphical representation as well as tabular format. (2)
   ii. Accommodate "rapid monitoring" by providing the ability to "quickly examine and understand" the dashboard data. (2)
   iii. Understand that the root of the problem of a lack of dashboard usage is poor data representation. (2)
   iv. Display a dense array of information in a small space and in a manner that communicates clearly and immediately." (2)
   v. Leverage the "power of visual perception and the human brain to sense and process several chunks of information rapidly." (2)
   vi. Understand that design is integral to the development process and includes "a solid understanding of visual perception and human cognition." This process requires design expertise and "practical dashboard design skills" in order to produce dashboards that work. (2)
   vii. Present information effectively. (2)
   viii. Ask which specific information should be displayed on the dashboard? List all of the data items that should be included on the dashboard. Also indicate the level of summary/detail at which each item should be expressed on the dashboard. (3)
   ix. Ask what are the logical groupings that could be used to organize these data items on the dashboard? Into which of these groups does each data item belong? (3)
   x. Are concise, condensed, and only include that which is absolutely necessary. (2)
   xi. Are easily read and understood. (2)

xii.   Provide simplicity. (2)

xiii.   Provide a quick overview of what is happening and what needs attention. (2)

xiv.   Bring attention to items that need to be addressed and require a response. (2)

xv.   Utilize "sparklines" that illustrate trends over time as opposed to gauges. This practice provides "historical context for what is happening now." (2)

xvi.   Utilize "bullet graphs" to provide a richer display of data in less space. Bullet graphs provide comparative measures, multiple metrics, and historical context whereas gauges do not. (2)

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About ESP Solutions Group

ESP Solutions Group provides its clients with *Extraordinary Insight™* into P20W education data systems and psychometrics. Our team is comprised of industry experts who pioneered the concept of "data-driven decision making" and now help optimize the management of our clients' state and local education agencies' information systems.

ESP personnel have advised school districts, all state education agencies, and the U.S. Department of Education on the practice of P20W data management. We are regarded as leading experts in understanding the data and technology implications of ESSA, SIF, ED*Facts*, CEDS, state reporting, metadata standards, data governance, data visualizations, and emerging issues**.**

Dozens of education agencies have hired ESP to design and build their longitudinal data systems, state and federal reporting systems, metadata dictionaries, evaluation/assessment programs, and data management/analysis and visualization systems.

To learn how ESP can give your agency *Extraordinary Insight* into your P20W education data, contact us at (512) 879-5300 or info@espsg.com.

This document is part of *The Optimal Reference Guide* Series, designed to help decision makers analyze, manage, and share data in the 21st Century.

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