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Hertford County Schools

Information Management System:

**A Support System for Research-Based
and Data Driven Decision-Making**

Phase I

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Introduction

During the 2006-07 school year, Hertford County Public Schools initiated development of a district-wide comprehensive strategic plan. One of the objectives designed to meet the goal of being governed and supported by 21st Century systems, was to develop an information management system. A review of related research provided the foundation for this proposal to guide the district in developing its information management system.

Included in this proposal are related components from the district strategic plan. It also includes reference to key components from “System-wide Improvement: Focusing on Student Learning”, NSSE, 2004. A special focus was placed on a systems thinking model that has been used as a foundation for systemic improvement during the past year.

A major resource for designing the information management system was the “Forum Guide to Decision Support Systems: A Resource for Educators”, National Forum on Education Statistics, September 2006. The development of impact analysis and program evaluation processes as a major component of the information management system was also recommended.

Hertford County Schools District Strategic Plan

State Board of Education Goal 5: North Carolina public schools will be governed and supported by 21st Century systems.

Hertford County Public Schools Goal 5: Hertford County Public Schools will be governed and supported by 21st Century systems.

Objective 5.1: By June of 2008 develop, and each year thereafter, utilize an information management system to facilitate data-driven decision making based upon Hertford County Board of Education approval.

Strategy 5.1.1: Establish a systematic process for collecting and managing the system's profile data, data related to Board of Education priorities, and data required by state and federal mandates.

Strategy 5.1.2: Establish an information management system that:

- Is reliable, easily updated and readily accessible.
- Provides longitudinal analyses of student performance and instructional and organizational effectiveness to reveal trends in data.
- Correlates data from different sources.
- Provides comparisons to similar school systems.

System-wide Improvement: Focusing on Student Learning

Introduction

According to the National Study of School Evaluation (NSSE) “System-wide improvement refers to a comprehensive and continuous improvement process at the school system level and within each school or learning center.” (p.1). The following are excerpts from “System-wide Improvement: Focusing on Student Learning, (A Comprehensive Guide for Research-Based and Data-driven System-wide Improvement), NSSE, 2004.

This handbook was the foundation resource for Hertford County Schools process for continuous improvement. The excerpts provide a direct connection between the school improvement process and the rationale for the recommendations in this proposal.

Overview

“To advance system-wide improvement, school system leaders need to fulfill two critical roles. They must continuously improve the overall education system; and, they must also provide support for the improvement efforts of individual schools.” (p.4)

“NSSE’s framework for continuous improvement includes the following components:

- Building a Shared Vision
- Developing the Profile
- Designing the Plan
- Implementing the Plan and Documenting Results” (p.4)

“The role of data is vital to the effectiveness of the continuous improvement process. ...

“With a comprehensive set of meaningful and pertinent data drawn from measures that matter, the design of your action plans can be tailored to address the specific needs of the students you serve. Rather than developing a one-size-fits-all plan, a thorough analysis of the profile data can enable you to customize you plans for improvement.” (p.7)

“Once the design of the action plan has been completed, the focus of the planning framework shifts to supporting the implementation of the plan and documenting its impact.”

Knowledge Management

“Knowledge management is a conscious strategy of getting the right knowledge to the right people at the right time, and helping people share and put information into action in ways that strive to improve organizational performance.” (Grayson & O’Dell, 2000)

- The American Productivity and Quality Center (APQC) (p.64)

NSSE's Framework for Data-Driven System-Wide Improvement

“To help school systems establish a comprehensive knowledge management system, NSSE has developed a four-part framework:

- **Mining the Data:** collecting and managing pertinent information
- **Analyzing the Data:** analyzing and synthesizing the data to create meaning
- **Communicating the Data:** building understanding by effectively interpreting and reporting the data
- **Using the Data:** maximizing the role of data in decision making and the continuous improvement process.” (p 65)

Accountability, Learning and Systems Thinking

The “From Accountability to Learning and Back” model provides guidance in making the connection from Federal and State requirements to individual student learning. For the information management system to be effective, the processes must be aligned throughout all levels of the district’s functions (See Figure 1).

The “Iceberg” model reflects the importance in finding root causes that impact student learning and organizational performance. It is important that we look beyond the surface to find factors that will impact student improvement (See Figures 2 – 4).

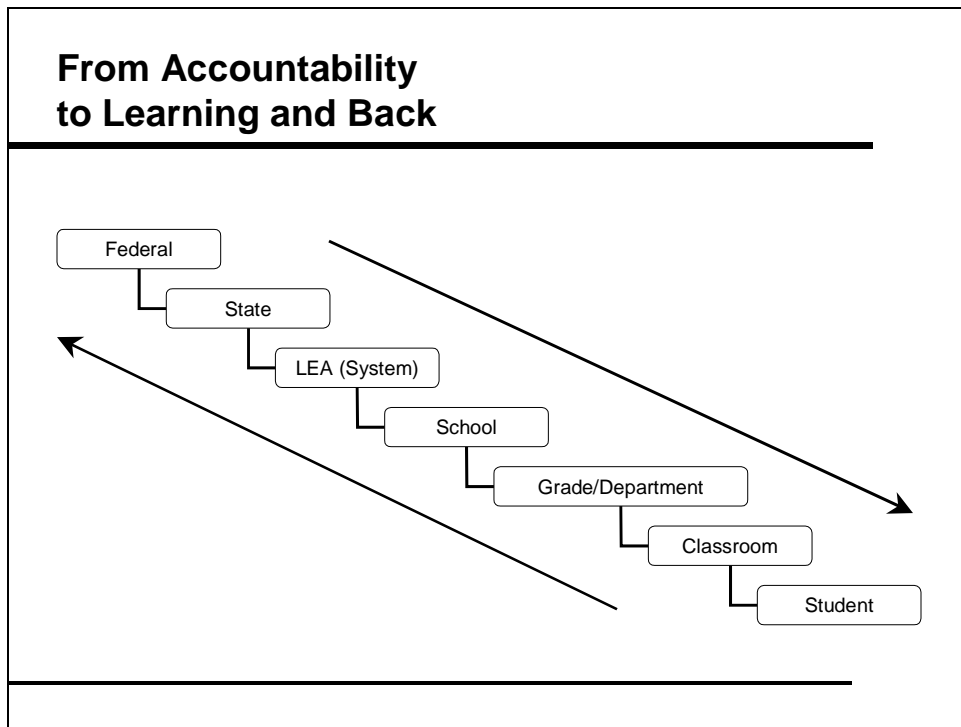


Figure 1

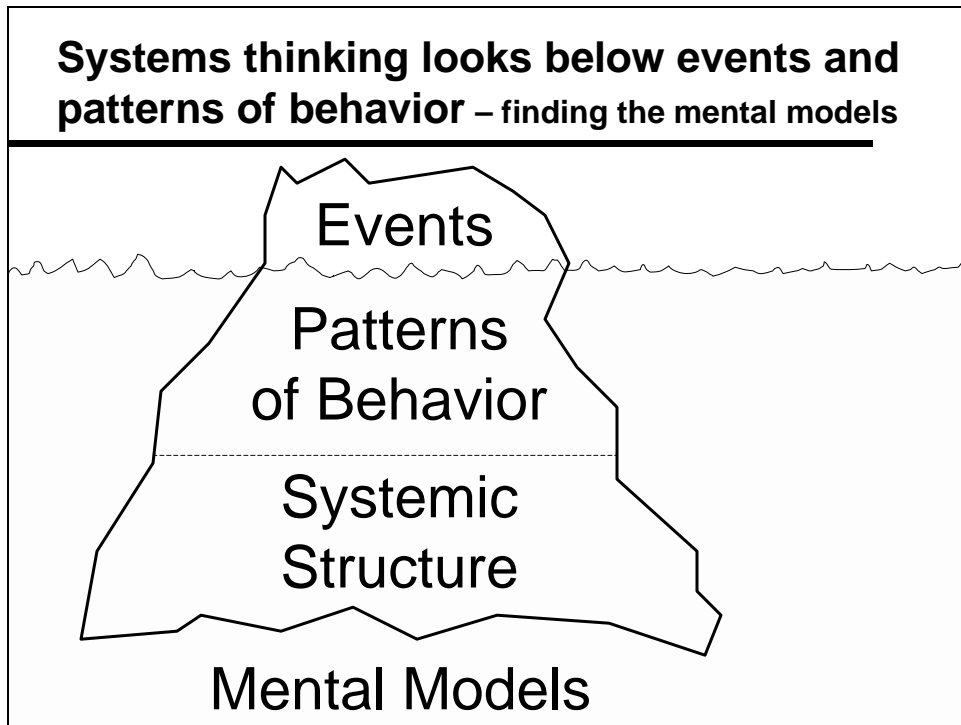


Figure 2

Some Definitions

- ◆ **Events.** The things we see happening (and sometimes wonder why).
 - ◆ **Patterns of Behavior.** Consistent and regular actions or events over space and/or time.
 - ◆ **Systemic Structure.** “Permanent” relationships and flows of information between parts of the system. Such as roads, policies, laws, organizations, buildings, classroom set up.
 - ◆ **Mental Models.** The shared belief systems, ideas, assumptions and goals of a system. Usually unstated but universally understood.
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Figure 3

The Iceberg

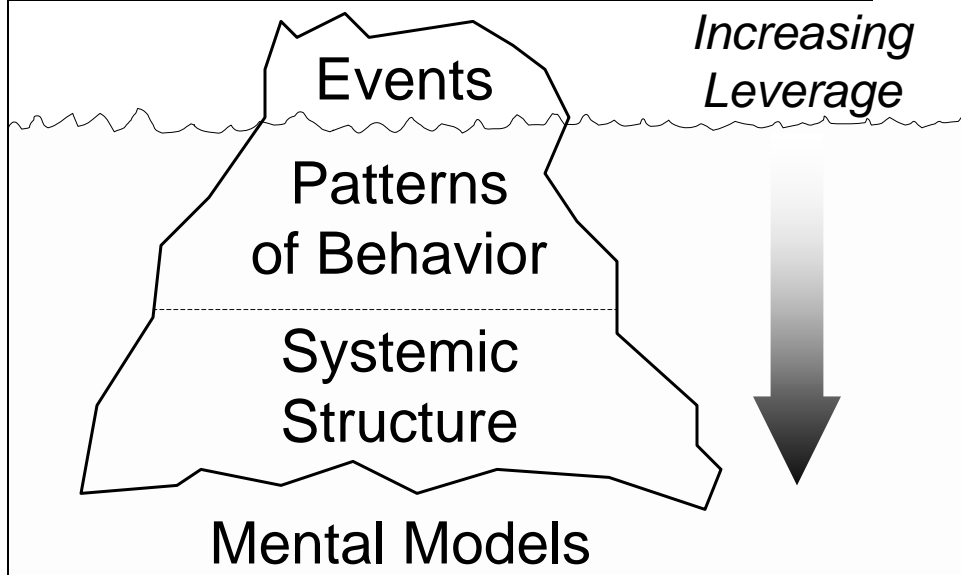


Figure 4

Decision Support System Framework

In reviewing research, the following outline represents the recommended process to be followed in developing the information management system for Hertford County Public Schools. (Summary from **Forum Guide to Decision Support Systems: A Resource for Educators, National Forum on Education Statistics, September 2006**).

I. Support System for Data-Driven Decision-Making

- A. What is a decision support system?
 - 1. Users who understand what the data mean and how they can be accessed
 - 2. Technology system that manipulates the data
 - 3. Integration of data from multiple sources for explicit purposes
 - 4. Decision-making system (user driven within the organization)
- B. How does a decision support system differ from a data warehouse and a data mart?
 - 1. Data warehouses and data marts are repositories of data that serve the functions of querying and reporting data
 - 2. Data warehouses and data marts are not generally concerned with the end user as a decision support system would
 - 3. Data warehouses and data marts do not offer the sophisticated data analysis and reporting capabilities of a decision support system
- C. What types of questions might a decision support system address when used in an education organization?
 - 1. Utilizing a decision support system is a proactive way to use data to manage, operate, and evaluate education institutions. The following examples illustrate a few of the many questions a robust decision support system could potentially address.
 - 2. Questions about the classroom
 - a) Do students who have teachers with degrees in mathematics perform better on math assessments than students whose teachers have degrees in other areas?
 - To answer this question, the system might compile data from staff records (degree type), school records (classroom teaching assignment), and student gradebook systems (assessment results).
 - b) Are Hispanic students progressing at the same rate as students from other ethnic backgrounds?
 - To answer this question, requires data from student information systems (race/ethnicity) and student gradebook systems (assessment progress).

3. Operational questions that extend beyond the classroom
 - a) Are students in Supplemental Educational Services (SES) programs showing academic growth on large-scale assessments, improved attendance, or both?
 - To answer this question, the system might compile data from program records (SES participation), student gradebook systems (assessment growth), and student information systems (attendance).
4. Policy questions at the district/state level
 - a) Is there a correlation between the amount of school district funds dedicated to early childhood education and student performance?
 - This question requires data from district/state-level records, including school records (student performance), program systems (early childhood education participation), and finance systems (fund allocation).

II. Components of a Decision Support System

- A. What components, features, and capabilities commonly comprise a decision support system?
 - In general terms, decision support system components include the following:
 - *A decision support system does not make decisions; it only supplies information, presented efficiently, to help staff make decisions.*

Data Quality: The Foundation of Any Decision Support System

1. Data collection and maintenance

Hardware, Software, and Data Management Processes

2. Hardware, networks, and operating systems
3. Underlying data sources
4. Extract, transform, and load (ETL) processes
5. Data warehouse or data aggregator
6. Analysis and reporting tools
7. User Interface

B. Data Quality: The Foundation of Any Decision Support System?

1. Data Collection

- Data are the foundation of any decision support system. High quality data are useful (relevant to decision making), valid (accurately measured), reliable (reproducible), and timely (available in time to influence decision making).
- ***As with any data-based system, the quality of information available from a decision support system depends on the quality of the data originally entered into the system.***
- Data systems that produce quality data often emphasize:
 - a) Appropriate data collection schedules;
 - b) Rigorous verification and documentation requirements;
 - c) Thorough validation procedures;
 - d) Clear, accessible, and customized coding instructions;
 - e) Effective training and support programs;
 - f) Accurate and consistent data entry;
 - g) Automated data transfer processes; and,
 - h) Consistently applied terminology (a data dictionary) and rules for data collection and maintenance.

2. Hardware, networks, and operating systems

- In general, most decision support systems will include the following:
 - a) Hardware, networking technologies, and operating systems necessary for supplying and supporting databases and/or servers;
 - b) A user interface with mechanisms for accessing, manipulating, and transferring data; and,
 - c) Some type of repository for temporarily or permanently storing data.

3. Underlying data sources

- The data used to make decisions in education organizations come from many disparate sources, both internal and external.
- The distributed nature of these data sources presents three challenges that must be addressed before a decision support system can effectively produce useful information:
 - a) Accessibility
 - b) Ownership
 - c) Interoperability

4. Extract, transform, and load (ETL) process

- The extract, transform, and load (ETL) process is necessary when source data in a decision support system reside in separate, non-interoperable databases.

5. Data warehouse or data aggregator
 - If the ETL process is not required, it can be replaced with a “data aggregator,” a tool that simply locates and compiles queried data rather than editing, cleaning, and verifying it.
6. Analysis and reporting tools
 - An “analysis tool” is basically an instrument that applies business rules or other logic to data in order to derive meaning.
 - A decision support system’s reporting functions must serve a wide range of users—including novices and users with expert analytical capabilities. To accommodate this, most systems offer two primary classes of reporting tools:
 - a) Predefined (static) reports that require little system expertise and are ideal for users with typical information needs; and,
 - b) Dynamic (ad-hoc) report-generating capabilities that require greater understanding of both the data and the querying technology, but allow users to investigate more complex questions.
7. User Interface
 - The user interface, sometimes referred to as a dashboard, presents information and enables a user to access or compile new data by means of a series of controls.

III. Developing a Decision Support System

- A. How does an education organization buy or develop a decision support system?
 - Many methods have been published for developing a decision support system. Most contain the same general steps, although the tasks may be described differently.
 1. In general, these steps are as follows:
 - a) Define the task, conduct a needs assessment, establish technology and functional requirements, and describe current resources.
 - b) Evaluate defined needs relative to current capabilities.
 - c) Perform cost-benefit analysis and select a solution that best meets the goals of the initiative.
 - d) Purchase (or develop) and install the selected solution.
 - e) Secure technology and information based on findings from the risk assessment.
 - f) Plan for ongoing system maintenance and support.
 - g) Train users to maximize the utility and efficiency of the new system.
 - h) Integrate the resources and processes into daily routines and long-range planning.

2. Conducting a needs assessment

- a) A “needs assessment” is an evaluation of all the tasks and functions an organization should be capable of performing.
- b) Most data and decision making needs arise from “users,” the people who “use” the organization’s data to decide how to manage, operate, and evaluate a school, or district.
- c) The need for good planning cannot be overstressed: correcting problems can be much more expensive and time-consuming than planning for contingencies in the first place.

3. Data security planning

- a) In education organizations, the underlying data in a decision support system often include private information about students and staff members.
- b) Education organizations should enact strong policies and procedures to ensure compliance with state and federal regulations governing the privacy and confidentiality of personal information.
- c) A properly configured decision support system can actually help protect data confidentiality.

4. Disaster recovery planning

B. How are stakeholders trained to use a decision support system?

1. User training

- a) Properly trained users are perhaps the most critical component of effective decision support systems. Users can be trained to understand the data and its limitations, as well as the system and its capabilities.

2. Differentiated Professional Development

- a) Because each stakeholder group may use a decision support system in a different manner, developing separate training modules for each major type of user group often makes sense.
- b) ***Differentiated professional development is a key to the successful implementation of a decision support system.***

3. Ongoing Professional Development

- a) After having had an opportunity to become familiar with the system, use it, and even make mistakes with real queries, users will require ongoing training.
- b) As in-house users learn the system, some may be able to serve as trainers in future training sessions.

IV. Impact Analysis and Evaluation

A. Impact Analysis

Impact analysis may be defined as an information gathering exercise designed to methodically identify:

1. The processes or functions performed by an organization
2. The resources required to support each process performed
3. Interdependencies between processes (and/or departments)
4. The impact(s) of NOT performing a process
5. The criticality of each process
6. A Recovery Time Objective (RTO) for each process
7. A Recovery Point Objective (RPO) for the data that supports each process

Often performed as a step in the development of business continuity plans the BIA, along with the Risk Analysis (RA), provides the foundation for developing and selecting business continuation strategy that will allow the organization to continue to perform critical processes in the event of a disruption.

Development of a formal impact analysis process is an important phase of creating an effective decision support system.

B. Evaluation

Program evaluation is essentially a set of philosophies and techniques to determine if a program 'works'. It is a practice field that has emerged, particularly in the USA, as a disciplined way of assessing the merit, value, and worth of projects and programs. Evaluation became particularly relevant in the 1960s during the period of the Great Society social programs associated with the Kennedy and Johnson administrations. Extraordinary sums were invested in social programs, but the means of knowing what happened, and why were not available.

Development of a formal program evaluation process is an important phase of creating an effective decision support system.