CHAPTER 1

Models and tools for creating, collecting, codifying, and sharing information

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Get your facts first, then you can distort them as you please. (Mark Twain)

Questions for Reflection

- What are models for data-driven decision-making?
- How do they apply to educational contexts and settings?
- Why are they useful for improving the overall function of schools and organizations?

Introduction

Information continues to flood our lives and has become pervasive. Consider the following facts surrounding print, video, and electronic information.

- The total volume of information on the web: 167 terabytes
- Paper: 1510 sheets of paper per person-year
- Film: 420 terabytes
- E-mail sent in 2002: 31 billion

The total amount of information available in 2003 was estimated at 5 exabytes. One exabyte is equivalent to one quintillion bytes. This is hypothesized to be enough space to capture every word ever spoken by all humans (UC Berkely study, 2003). Information has continued to grow in the last 4 years; however, using this information for decision-making remains a challenge.

Data Driven Decision-Making

Data-based Inquiry and Decision Making (DBIDM) is a deliberative process in which teachers, administrators, students, parents, and other community members examine and analyze a range of data relating to problems and challenges, and develop action plans to address them.
Educators continue to try and maintain high quality instruction while at the same time responding to state standards for instruction, required ongoing data collection and reporting requirements, as well as preparing students for state-wide testing (see figure 1).

Educators are concerned about many questions including the following:

Figure 1

Data-based Inquiry and Decision Making

- Setting the Vision
- Collecting and Analyzing Data
- Action Planning
- Identifying Challenges

Figure 1
• What is the percentage of the students at each achievement level?
• Did we meet the state high standards of performance this year? (grade, content area)
• Are we making progress toward meeting the standards? (look at last three years)
• Are there disparities in group performance?
• What percentage of students are making gains?
• How do our scores compare to the scores for other schools similar in size and scope to my school or organization?
• How do the scores compare to where we want to be?
• What are the factors affecting these results?

The main cycles of decision-making are included in figure 1 below. The steps of decision-making process begins with setting the vision. A school’s vision is based upon what students should know and be able to do upon exiting the school. Members of the school community pose questions about what they want their school to be like. Their collective answers become the vision for the school, providing a collective identity and direction.

Consider what your school ought to be...A shared vision articulates a coherent picture of what the school will look like when the core beliefs have been put into practice.

Characteristics of a shared vision:
• Is developed collaboratively by students, staff, parents, and other community members
• Is expressed in clear language that is inspirational and free of jargon
• Explicitly states that the school seeks to improve the academic achievement and personal development of all students
• Sets high expectations and standards for all students, staff, parents, and other school community members
• Is known, understood, and owned by the whole school community
• Is continually affirmed, celebrated, and made public to the whole school community (e.g., in publications, parades, and assemblies)
• Forms the basis for the school community to assess progress in achieving core goals
• Is revisited annually

The second step requires teams collect and analyze data from a variety of sources. These sources help teachers, parents, students and other members of the school community know how they are doing, what is and is not working, and how to adjust their efforts towards improvement. Ongoing analysis of data provides schools with a comprehensive picture of its strengths and challenges, enabling the school community to make informed decisions. Successful, highly efficient organizations continuously tap rich sources of data available to them to make informed decisions and solve problems. To get a comprehensive picture of how a school is doing, schools need to collect and analyze a variety of data sources including: samples of student work and teacher practices, the school Self-Study, standardized tests, etc.

When we use data, we need to ask challenging questions such as:

• What strengths and challenges does the data reveal?
• What is the data telling us about our efforts to reach our goals?
• What can we do about what the data reveals?

Focus on using the data to raise questions about the school (e.g., why is there a discrepancy between the instructional practices teachers think are important and those that are most often used in classrooms?), rather than jumping to conclusions and solutions about what the data reflects. The following questions may also be helpful:

• Is this issue important to fulfilling our vision?
• What changes do we see from year to year?
• What sub-groups are described by the data?
• Are we where we want to be?

The third step requires schools and organizations to identify challenges by analyzing the data collected using specific benchmarks to guide the analysis. These benchmarks can help identify differences between vision and reality, and key challenges. The benchmarks also guide schools to pay particular attention to issues of equity. Identifying challenge areas is a group activities which results in prioritizing a few critical problems for further inquiry in the action planning process.

• The entire faculty analyzes the collected data. This is usually most effective in small groups. Groups analyze the data, look for patterns, and identify strengths and challenges.
• The entire faculty prioritizes challenge areas. Each small group presents its identified challenges to the faculty, naming specific challenge areas.
• The full faculty votes on two to four challenge areas for further inquiry and action planning. The priority challenges should be those that are believed to be the biggest barriers to improving student learning.
• Form study groups for each challenge area, with every faculty member participating in one group. Set a schedule of meeting times (e.g., common planning time, after school time, twice a month for one hour.)

The fourth step requires that teams engage in action planning. In action planning, schools and organizations focus on those areas for improvement that have the most impact on learning, teaching, and assessment. The causes of problems are identified, solutions and a plan of action are developed. When teachers collaborate to solve problems and are empowered through shared
decision-making, a more collegial school culture results. Teachers feel a sense of community and that they make a critical difference. The last step encourages decision-making teams to engage in annual assessment. Initially, the Leadership Team, and in subsequent years the entire faculty, uses the original benchmarks to conduct an assessment of the school’s progress. This is a streamlined process that takes from 2–3 hours up to a day; it does not involve actually collecting evidence, but rather citing evidence collected during the course of the year. The process includes setting annual measurable goals for improving learning, teaching, and assessment. Action planning requires teams to *discuss the problem*. The group gains a clear and common understanding of the problem before trying to solve it. This involves discussion of the true nature of the problem and looking at different facets of the problem. Without a clear understanding of the problem, the group may embark on solutions that are ineffective. Teams engage in brainstorming hypotheses on specific problems within the system. Why does the problem exist? The study group looks at the challenge area from all perspectives, including those of students and parents. The group gathers additional data, if needed, by talking to people connected with the challenge area and looking over relevant documents. Then the group generates a number of different hypotheses to test. Teams need to create an action plan based on the solution(s) and available resources. The study group ensures that the solutions clearly address the challenge area and the causes of the problem. The group identifies the goals of the action plan, an implementation strategy to solve the problem based on the solution(s), and guidelines for evaluating the plan. A detailed plan of action should include timelines, person(s) responsible, and resources needed.

It is important for leadership teams to present the action plan to the whole faculty. The Leadership Team helps assess and refine the action plan before it is presented to the whole
faculty for approval and implementation. Teams then prioritize, test, and confirm hypotheses. The group tests each hypothesis to see which ones appear to be accurate explanations for why the challenge area exists. For each hypothesis, the group should look for concrete evidence or data that is the source of the challenge problem.

It also encourages teams to *brainstorm possible solutions*. The group brainstorms solutions for the cause(s) and considers resources both within and beyond the school walls. Using a variety of resources such as research and visits to other schools will help in arriving at solution(s). The group sifts through the suggested solutions and selects those that best address the problem or challenge area. As you consider solutions, here are some questions to ask:

• Will the implementation of this solution address the problem?

• What potential obstacles are there?

• Is the solution practical?

• Are there enough resources?

State the problem in the form of a question. The study group states the problem clearly as a question to focus efforts on generating hypotheses and searching for causes, and assess overall progress. The Leadership Team, study group, or whole faculty assess the implementation of the action plan and make necessary adjustments to it. As you work, consider these questions:

• How effective was the plan?

• Did it address the problem?

• Were there any unanticipated outcomes (positive or negative)?

• Were there any obstacles to implementing the plan?

• What changes, if any, do you need to make to the plan or its implementation?
As we can see, there are many factors driving our increased use of data to make better decisions about schools and instruction. A recent report from the Educational Testing Service, called *America’s Perfect Storm* (2007) indicates three driving factors beyond federal and state policies. The first is national and international surveys indicating that large numbers of adults do not have sufficient command of numeracy and literacy. The second is a changing U.S. economy, and the third is demographic trends. Our schools are being impacted dramatically, and this will only continue to challenge our nations educators. The real question is, How can knowledge management and data driven decision-making help?

**Data Driven Decision-making and Knowledge Management**

While data and information lives in computers, knowledge lives in people. You may hear the terms knowledge management and data driven decision-making used in tandem. Petrides and Nodine state that “At the most basic level, knowledge management can be described as a set of practices that helps to improve the use and sharing of data and information in decision-making” (2004). Fullan furthers this idea by stating, “Information is machines. Knowledge is people. Information becomes knowledge only when it takes on a “social life”. By emphasizing the sheer quantity of information, the technocrats have it exactly wrong: if only we can provide greater access to more and more information for more and more individuals, we have it made. Instead what you get is information glut” (2002).

Knowledge management practices, as Petrides, Nodine, and Fullan suggest, are making their way into schools with the ultimate goal of enhanced decision-making, regardless of the terms. Educational leaders and practitioners want to use data to support student achievement, to monitor individual student progress, and use an ongoing data collection and analysis process to make decisions about where to allocate time and resources, assist each other to understand and
use measures of school performance, and build and sustain a culture there principals, teachers, and all other staff to use data for improved instruction and school improvement.

**Data Necessary for Change**

**Framework for Decision making**

In *Data Analysis for Comprehensive Schoolwide Improvement*, Bernhardt lists seven questions to help focus the early stages of data-driven decision making:

- What is the purpose of using data in the school or district?
- What do you expect students to know and be able to do by the time they leave school?
- What do you expect students to know and be able to do by the end of each year?
- What will they acquire by the time they leave school?
- Do you know why you are getting the results you get?
- What would your school and educational processes look like if your school were achieving its purpose, goals and expectations for student learning?
- How do you want to use the data you will gather?

In this sense, data are seen as the vehicle to understanding larger systems issues, such as the influence of the whole-school environment on individual student achievement. Understanding these issues is important to applying discovery techniques to available data. Knowing the overall context in which decisions are made directly influences the larger picture of education. For example, if discovery methods are applied to only one component of a system, like technology, the larger context is lost since technology is not the sole predictor of student success.
Bernhardt (1998) also suggests the analysis of four major data strands that educators should collect for effective change, being demographic data, student learning data, perception data, and process data. Further elaboration for each is as follows:

- **Demographic Data**: includes background information on students, staff, and schools. Such data could be gender, ethnicity, number of years in the district, attendance, teacher certification and school enrolment.

- **Achievement Data**: includes student results on state assessments, district tests and teacher-development tests.

- **Instructional Processes**: includes information about the curriculum, interventions the students experienced, the teachers students were taught by and so on.

- **Perception Data**: includes individual views, values and beliefs about systems where people work and learn, and may be gathered through questionnaires, interviews and observations.

When these types of data are combined, various questions can be answered. For example, by using information on the instructional processes students’ experience, school board members can determine which programs or instructional strategies are working (or not working) for which students, and whether additional programs are needed. When considering this along with the concerns reported out of ETS, America’s Perfect Storm, these different data groups become critical for decision-making.

**Models for School Improvement**

There are various types of models of DDDM that change agents can use for creating, collecting, codifying, and sharing information. Each model can be modified to meet the needs of the organization depending on the unique attributes stemming from school culture, leadership
style, and current contexts. All of the models are cyclical because of the changing nature of data and the continual need to revise the program depending on the latest data collected. Continual reevaluation of data that exists in your school or organization is critical to effectively executing the matching intervention to help your organization move towards your goals and mission.

There are several models offered in this chapter that can be used as is, or can be adapted to your needs. The following model was developed through collaboration between Evantia, an educational research organization and the Council of Chief State School Officers (CCSSO) to help their clients meet and maintain federal and state mandates (see Figure 1).

*Figure 2. Streifer, A. (2002) model of Data-Driven Decision Making*

This model begins by going through the steps of forming a school improvement team that can effectively and objectively develop a hypothesis, which is the second step. This step assures that the data collected will help make decisions to improve student learning. After the development of the hypothesis, the needed data is gathered. The authors stress the importance of
using multiple data sources and selecting the most useful sources to effectively use the data to answer the questions developed in the previous step. The data is then organized, analyzed, and interpreted during the next step. During this step, the school improvement team must also look if the data raised any additional questions that need to be answered to help raise student achievement. From this step, a data-based plan must be developed and implemented. Once the plan is implemented, the progress must be monitored frequently and the success must be documented. Although not referred to by the author, the failures must also be documented in order to develop either better questions or more effective plans during the evaluation process of this DDDM process.

The second sample DDDM model has six steps: problem, data gathered, data analyzed, solution(s) generated, implemented best-fit solution, and monitor & adjust (see figure 2).

![Figure 1: Data-Based Decision Making Model](image-url)
This model, like the first model is cyclical. Streifer (2002) points out that “90 percent or better is spent on data gathering and analysis due to the complexity of these processes… and this leaves precious little time, 10 percent or so, available for solution generation and implementation.” During the initial step of identifying the problem, Streifer stresses the importance of creating a concept map to fully understand the problem. In the second step, he shows the importance of bringing all of the data into one database or spreadsheet to effectively analyze the data. In the third step, an analysis must be conducted for each of the subcategories in the concept map. Through the analysis, there might be several solutions that might be plausible, but the best-fit solution must be decided on to implement. And then, the change agent must monitor and adjust the implementation depending on the progress towards the goals formed during this cycle. The National Turning Points Center illustrates, a cyclical process of DDDM is an ongoing process and therefore, the leader can go to any of the components as needed at anytime and one can also go in any order that is suitable to his or her needs.

**DDDM Principles for Selecting and/or Developing Appropriate Models for Predicting Change**

There are various models of DDDM that can be followed, but the model you select depends on your goals and your underlying principles. For example, in Center for Collaborative Education’s (2004) guide to DDDM, there are six underlying principles for transforming middle schools. The six turning points practices are improving learning, teaching, and assessment for all students, building leadership capacity and a professional collaborative culture, data-based inquiry and decision making, creating a school culture to support high achievement and personal development, networking with like-minded schools, and developing district capacity to support school change. Within this framework, they chose the following DDDM model (see Figure 3).
Figure 3. Center for Collaborative Education (2004) model of Data-Driven Decision Making

Sharing Information:

If you are not going to share the information, why collect the data? In most cases, it takes more than one person to effectively identify a problem, collect the data, analyze the data, implement a solution, and monitor the progress. Therefore, sharing the information within the school, as well with other schools is important to effectively and efficiently resolve a certain problem. The information you share may be different depending on their role and affiliation to the school. For example, you may or may not share all of the information that you shared with your teachers with the parents. The teachers may need the extra information to effectively implement the solutions, whereas the parents may only need the general plan and the desired results to keep them informed of their child’s future.

The information can be shared in various ways, but in a technological rich environment, online tools such as Blackboard, Moodle, and school websites can help faculty and staff receive and give updated information about the initiative. In a time where teachers are extremely busy to meet face-to-face, these venues can be an invaluable way of sharing the information quickly.
Information can also be shared through a secured folder on the network or email, depending on the technology available at school and the comfort level of the administrators and teachers. The school website can also be used to decimate the information to the parents, students, and the community. Information must be available in paper format as well for families and community members who do not have access to a computer.

**Conclusion**

Decision making remains one of the more challenging roles of every education professional. The importance of bringing expertise to the decision making process is obvious, but the best methods to acquire it may be more illusive. In his article, “The Mind’s Journey from Novice to Expert,” Bruer (1993) makes a convincing case that:

If we understand the mental process that underlie expert performance in school subjects, we can ask and answer other questions that are important for education. How do students acquire these processes? Do certain instructional methods help students acquire these processes more quickly and more easily? Can we help students learn better? (p. 6)

According to Bruer, it is imperative that as educators, we understand what is needed to move students to success “. . . if we know the route, we can help students negotiate their way” (p. 6). Or put another way, if we know the pattern, we can predict the behavior.

Based on the dynamic nature of information and data, it seems reasonable to assume that Data driven decision-making and knowledge management will be central to the success and growth of most institutions and industries. The field of education is reengineering data systems and creating a culture of practitioners using data to (a) to take advantage of the exponentially growing data to be managed for key decision making, and (b) to develop learning communities and systems to support them. General models of decision-making are successful integrated
systems at every level to expedite information and knowledge sharing and to generate individual, group, and organizational learning.
Class Scenario Discussion

Unified Independent School District if the fourth largest system in the state of Texas. The district is facing a high drop out rate and low tests scores for most subgroups. The technology and reading initiatives are driving the organization. While the focus is on improved test scores, there are issues with the current intervention models – both with the reading initiative and the focus on how technology is being delivered in schools and classrooms. Depending on the principal involved, these programs range from heavily emphasized where all individuals are onboard and implementing consistently to those schools whose principals are struggling to provide enough professional development and implementation activities to make sure both the technology and reading are supported.

The key driver in this district is the assistant superintendent for instruction who is responsible for both initiatives. There is a professional development person in each of the 100 schools. It is the middle of the school year, and to date, the budget holds $100,000 per school to implement both programs. This funding has been provided by the state of Texas, Department of Instruction. All the schools have the materials they need to implement, both technology and reading. Materials were ordered based on the grade level. During the summer, there were two weeks of professional development for both teachers and administrators. Each school was to collect and disseminate data on: student achievement to date, descriptions of how technology is being used to facilitate both the reading program and specific core content areas, status of ongoing professional development, as well as other data (attendance, discipline, and student demographics).

The district is responsible for reporting back to all stakeholders, which includes the board of education. Take one of the following roles, assistant superintendent, knowledge management consultant, evaluator from the state department of education, and respond to the following (cite information from your readings as appropriate):

1. As the leader, what do you see as the core issues at stake in this scenario?
   a. What would be the first priority?
2. What patterns, trends, and relationships in the data would you target in order to identify what needs to change in the implementation?
   a. What patterns, trends, averages, and relationships does this team need to look for?
   b. In addition, what data categories would be helpful to include for improved decision-making?
3. Based on the models you have for data driven decision-making, choose one and discuss how it would be used in developing an implementation plan and state who would you include in the implementation plan?
   a. How should the data that is being collected be aggregated and/or disaggregated and how could this be used for benchmarking in your implementation plan?
References


