SCHOOL DISTRICTS IN THE INFORMATION SOCIETY:
THE EMERGENCE OF INSTRUCTIONAL INFORMATION SYSTEMS

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Introduction

Even the most casual observer of modern day America will have noticed the breathtaking pace at which microcomputers are being introduced into our work places and homes. This phenomenon marks an important milestone in the journey from an industrial society to the much heralded information society.

This transition to an information society has tremendous implications for everyone -- at home, in the office, on vacation, or in school. To date, the educational implications of the technology explosion have received considerable attention as various pundits have tried to predict the impact the computer will have on classroom instruction, on curriculum development and, indeed, on the very structure and purpose of schooling itself.

In this article we want to describe yet another dimension of ways in which the emerging information society might impact on schools, namely, how school districts can begin more effectively to integrate information into their instructional decision-making systems.

During the past three years at UCLA's Center for the Study of Evaluation, we have investigated ways in which a number of school districts have tried to link their testing programs and evaluation/research activities with instructional decision making. Our work has included case studies in eight districts that had a reputation for having forged some kind of testing-evaluation-instruction linkage. In addition we have reviewed and synthesized the theoretical and research literature in several related fields such as school administration, testing, evaluation, decision making, and management information systems.

Surveys and field work (Lyon et al, 1978; Bank, Williams & Burry, 1981) have revealed that most school districts already collect considerable amounts of data with potential value for instructional decision making. However, these data often remain as unused resources because they are not analyzed or reported in a way that is useful for instructional decision making at the classroom, school building, or district level.

In our eight districts, we have observed attempts to create useful data storage, retrieval, and reporting systems. These we have called instructional information systems (IIS) to suggest a partial analogy with management information systems (MIS). As a contribution toward further understanding what instructional information systems might do, we will, in this article:

1. define what we mean by an instructional information system (IIS);

2. identify and describe the components of a district instructional information system;

3. provide a brief description of three different instructional information systems that presently operate in districts;

4. suggest a direction for a school district instructional information system that is compatible with its organizational context and avoids some common errors that sometimes plague management information systems.

Before embarking on these three topics, let us first share what we observed across our sample districts as common elements in the development and evolution of existing school district instructional information systems. These elements seemed to distinguish these districts from other districts which collected data, e.g., test scores, but did not make instructional use of them:

° a stable external environmental setting;

° within-district presence of "idea champions" and a critical mass of long-term supporters;

° the availability of sufficient resources, both fiscal and technical, over a relatively long period of time -- six to eight years in many cases (Williams & Bank, 1981).

Another striking element which appeared to characterize our eight districts was the ad hoc nature of the development of the system. In none of the districts had there been a blueprint or a timeline for developing an instructional information system. Indeed, the term "instructional information system" was not in common use in these districts. Rather, what we observed were individual activities, sometimes formalized in job descriptions but more often informal, which served to combine the collection and analysis of data with a delivery and support system for users at the classroom, school, central office, and board levels concerned with instruction.

Thus, it is important to note that the term "instructional information system" used in the remainder of the paper is a construct which we have used to bound certain types of district-wide activities. This construct suggests that what goes on in school districts which link evaluation, testing, and instruction may bear a partial resemblance to what are termed management information systems in other organizations.

What is a School District Instructional Information System?

In its simplest and most obvious form, an instructional information system is some method by which information of some kind is transmitted to and used by someone or some group in a school district in relation particularly to the content or delivery of instruction. But we want to put more specific limits on such a definition.

The topic of information and its use has been a research subject in its own right. There are over 20,000 titles under the term "information" in the ERIC system (Mansfield, 1983). Human beings are capable of organizing vast amounts of information into patterns which influence their decisions and their actions. This "body of knowledge that administrators and policy makers use spontaneously and routinely in the context of their work . . . - the entire array of beliefs, assumptions, interests and experiences - " has come to be called working knowledge (Kennedy, 1982). Such working knowledge may often interact with -- that is, influence and be influenced by -- formal social science data. It is, however, this latter type of data -- intentionally collected and analyzed in a prescribed and standardized format -- which we are calling "information."

The term "system," like the term "information," is in widespread use, particularly in the literature on organizations. When used here, it does not describe the school district as a whole, but rather refers to a separate subsystem which has its own purposes, organizational structure, staff, and linkages to that larger environment.

Instruction is a third broad term which has different meanings depending on context. We use it here to refer specifically to intended interactions within the classroom or school environment that affect student learning. The decisions that affect those interactions -- such as texts, number of aides in the classroom, amount of time to be spent in a subject area, teaching methods -- may be made by boards, committees, principals, teams, or individual teachers. Whoever the decision makers or decision implementers, and whatever the topic under consideration, if it pertains to the schools' shaping of students' learning, we count it as instructional.

As indicated earlier, the term instructional information system was chosen to suggest a rough analogy to management information systems. A management information system has been defined by Walter J. Kennovan (1970) as "an organized method of providing past, present and projection information relating to internal operations and external intelligence. It supports the planning, control and operational functions of an organization by furnishing uniform information in a proper time frame to assist the decision-making process." To parallel this definition, instructional information systems in school districts might be characterized as loosely organized methods of providing to those concerned with instruction past and present information relating to student attainment and program evaluation. Instructional information systems support users' decision making by furnishing them with particular and limited types of information in a time frame and format appropriate to their decision-making processes.

Components of District Instructional Information Systems

As noted earlier, district instructional information systems are rarely conceptualized as such by the people within school and district settings. The five components, which we categorize as "core" components, are terms we derived from the literature on management information systems. To greater or lesser degrees these components were present in all of our sample districts even though they were not always so named by district respondents.

The three additional components which we have labeled as contributory are not part of the description of most management information systems. They were, however, also present to some extent in all eight of our

districts. They were there to provide users of the data with guidance and assistance for making instructionally-related decisions and with support for carrying out those decisions in the central office, in schools, and in classrooms. Central office personnel who had established the systems often noted that these extra-system components were necessary to system maintenance. Without them, they said, it would be likely that principals and teachers would revert to exclusive reliance on working knowledge.

Core components of a district instructional information system:

1. specified users
2. specified uses
3. specified types of information inputs/outputs
4. specified information delivery procedures
5. specified monitoring of system functioning and of system use

Contributory components of district instructional information systems:

6. training for users in data-based decision making and
    implementation
7. availability of resources to support action planning
8. availability of resources to support implementation

The following is a comprehensive listing of the specific elements included by all eight districts within each component. Since districts varied from one another on the purposes of their instructional information systems, only a small subset of the elements of each component was relevant to a given district. Following this catalogue we will describe three models of instructional information systems on a case study basis.

1. SPECIFIED USERS:

> teachers
> principals
> others in schools, such as media and learning specialists,
>   substitutes, aides
> advisory committee members
> parents, media, prospective residents, real estate developers
> central office personnel concerned, for example, with curriculum,
>   supervision, staff development, personnel
> school board members

These users can be thought of as either direct or secondary users of the system; either regular or episodic users; either active or passive users.

2. SPECIFIED USES:

> planning instruction, identification of subject areas in which
>   students' need additional time or attention
> placing, grouping, regrouping of students
> remediating or supplementing students' instruction
> monitoring student progress
> identifying parent, teacher, student, opinions and attitudes
> determining the allocation of school level resources
> identifying school-wide needs
> selecting texts
> establishing school and district image
> communicating with interested others - e.g., federal or state
>   agencies and local organizations

3. SPECIFIED TYPES OF INFORMATION INPUTS/OUTPUTS:

> commercial norm-referenced test and subtest scores
> district-developed criterion-referenced test scores
> proficiency test scores
> state assessment test scores
> demographic and census data
> longitudinal individual student data
> attitude surveys of students, teachers, parents
> records of attendance, transiency, vandalism, etc.

4. SPECIFIED INFORMATION DELIVERY PROCEDURES:

> formats - printouts, written reports, oral reports, graphic
>   presentations, individual and small group briefings
> cycles - periodic, coordinated with other activities, as needed

5. SPECIFIED MONITORING OF SYSTEM FUNCTIONING AND OF SYSTEM USE:

> informal feedback
> ad hoc or standing committees reviewing information inputs,
>   outputs
> records of system use
> supervision of subordinates by superiors, peer review

6. TRAINING FOR USERS IN DATA-BASED DECISION MAKING AND IMPLEMENTATION:

> in asking questions of the data
> in interpreting test scores

in alternative methods of raising student achievement
in interpreting survey data
in understanding implications of trends
in inferring action alternatives from data
in deciding among competing alternatives
in implementing change

7. AVAILABILITY OF RESOURCES TO SUPPORT ACTION PLANNING:

training for individuals such as media or learning specialists
budget for release time, substitutes, conference attendance

8. AVAILABILITY OF RESOURCES TO SUPPORT IMPLEMENTATION:

trained individuals such as media or learning specialists
budget for release time, substitutes, conference attendance

Description of Existing Instructional Information Systems

The eight districts in which we did field studies had unique instructional information system configurations. For three of these districts we will utilize our eight components to provide a brief snapshot which will illustrate alternative forms of instructional information systems.

District A: Student Achievement Model

The purpose of this instructional information system is to individualize instruction. The direct users of the system are teachers and principals. Teachers use the test score reports, the output of the system, to plan instruction, to place students in classes, to group and regroup students, to assign remedial or supplementary materials, to communicate with parents. Prinicpals use the reports to monitor individual and group progress of students, to review teacher activities, to communicate with parents, and to share with one another estimates of school progress so that district policy making can be informed by principal input.

The type of data which the system collects and analyzes are students' criterion-referenced test responses. These criterion-referenced tests are keyed to a grade-by-grade district curriculum in math, reading, language arts. The tests are administered by teachers on a quarterly basis. Scores are reported by objective, by student, by reading group, by class, by grade level, and by school. Turn-around time from test administration to teacher receipt of printout is approximately a week. The format of the instructional information system's output is a computer printout and it is delivered to teachers by mail.

In this district, there are many ways to monitor system functioning and system use. Learning specialists in each school make sure that the tests are distributed, administered, and correctly processed. These learning specialists also assist teachers in analyzing and interpreting the scores and in making instructional plans based on these interpretations. The principals review all test scores, hold conferences with teachers during the year to discuss individual children, use the previous year's scores in making plans for the subsequent school year. Both teachers and principals use the criterion-referenced tests and the objectives to which they are indexed in conferences with parents and in between-conference reporting of student progress.

As for the contributing components of the instructional information sytem: The learning specialist in each school trains teachers in the interpretation of the test scores and in specific action planning and implementation activities. The criterion-referenced testing and curriculum coordination is supported by an elaborate multi-level professional

development program (PDP). In this program, teachers are required to attend courses where a diagnostic/prescriptive instructional methodology compatible with the criterion-referenced testing orientation is presented. Between sessions, the PDP coordinator observes in classrooms to make sure that teachers' applications of the teaching methodology are appropriate. More advanced PDP programs are offered based on an annual survey where teachers indicate their preferences for coursework. The PDP program, including the release time for teachers, the training of substitutes and aides, and additional conference attendance is part of the regular district budget.

District B: School Improvement Model

The purpose of this instructional information system is to facilitate school site planning decisions about the allocation of resources to meet needs perceived by parents, teachers, and students. The primary users of the system are school site councils, parents, and teachers, who divide themselves into subject matter committees to make plans for subsequent school years and to monitor the implementation of previously-made plans. Principals are secondary users as are teachers not on the school site council.

The uses to which the data are put include the identification of subject areas in which students need additional attention, determination of the allocation of discretionary school resources for identified school-wide needs, analysis of the opinion and attitude data from parents, teachers, and students in conjunction with student outcome data from standardized norm-referenced tests.

This district, on a once-a-year basis, administers a standardized test of basic skills. The printout is received back from the test publishers by school, by subscores. Further analysis is done by the district office and is made available to the school site planning team. In addition, the district has developed a parent and a teacher attitude survey, sent out once a year, collated by the district, organized in graphic format, and distributed to each school site council. Each school, furthermore, develops and distributes a "Smily Survey" to assess student attitudes toward particular subject areas.

The central office of the district provides to the school site council written reports with data not only from the current year but from previous years. When the system was in its infancy small group training sessions were held; district officials say that they have subsequently become unnecessary as new school site members are socialized into the process by more experienced colleagues. The distribution of the reports follows an annual cycle. The tests are administered in February, the surveys go out in March, the information is collated and fed back to the school site councils in April, decisions are made in May, plans are implemented starting in September, the school site council updates the timelines for the plans as the school year proceeds, school site council monitoring of the implementation of aspects of the plan occurs at meetings throughout the winter. The cycle then repeats itself.

As for contributing components: Training for teachers and parents when the system was first installed included group process skills, communication skills, decision making skills, skills in interpreting test score

terminology. Such training is no longer provided by the district routinely although it is available on an as-requested basis. The district releases teachers to engage in school site planning. The resources for implementing the action plans made by the site council come from the California School Improvement Budget and have been regularly available over the past five years.

District C: Staff Development Model

The purpose of this instructional information system is to enable central office staff to train teachers and principals in those subject matter areas in which students demonstrate deficiencies. The primary users of this system are the staff development, curriculum, and supervisory personnel in the central office. Indirect users are principals and teachers. The uses to which the information is put are primarily planning and conducting ongoing and summer staff development activities which either train teachers in how to instruct students in a particular area or encourage teachers to develop new text or supplementary materials. The information fed into this system comes primarily from a state-wide assessment test which compares school-level student achievement across the state. The press and the school district receive from the state the printouts of the scores organized in high-low order of school attainment. Subsequently, district officials receive more precise score breakouts. These data are supplemented by newly developed district-wide utilization school proficiency tests. In this district, there is no explicit monitoring of system functioning and system use.

As to contributing components: Since the primary users are central office personnel, there is limited need for training for them in decision making and implementation. Substantial amounts of district resources, both in terms of time and money, are made available to support action planning and the implementation of staff development activities.

What to Consider When Developing a District Instructional Information System

As we noted previously, instructional information systems are in a sense a selected educational application of management information systems. As such, we should look at what has been learned from those who have used and studied the usefulness of management information systems in other organizational contexts.

Because of space limitations, we will only summarize some of the major shortcomings users of management information systems have identified. Users complain that they:

- do not understand output
- do not get information in timely fashion
- do not get accurate information
- do not get information that provides them with the type of analysis they need

Systems designers and managers complain that

- costs and development time are high
- there is difficulty in keeping the system feasible and adaptive

Organizational analysts observe that MIS systems

- do not take into account the realities of organizational life
- alter the power relationships among departments, groups, individuals
- change the content of various jobs and tasks

From those suggestions and our field work observations, we would urge
that instructional information systems developers strive to:

1. Make the system attractive, easy to use, integrated into the daily
   life of district personnel, principals, and teachers.

2. Make the system responsive to the users' unique and normal styles of
   inquiry.

3. Make the system helpful to the user in formulating problems as well
   as resolving them; in generating alternatives as well as selecting
   them.

Summary

Clearly, school district instructional information systems are in an
early developmental stage. But IIS may be an idea whose time has come.
Existing testing, evaluation, and research activities that are often not
related to one another can be integrated into a single comprehensive sys-
tem. What is more, the development of increasingly affordable personal
computers provides the technology for easily providing instructionally
relevant information to wide and diverse audiences. We feel that the
potential benefits of this emerging information revolution can be best
realized if school districts begin linking together and ultimately inte-
grating their data into a comprehensive school district instructional
information system. The districts in which we have conducted our research
bear testimony that such systems can be developed and that they can provide
a very useful tool in building and maintaining an effective instructional
program.

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