To the Graduate Council:

I am submitting herewith a dissertation written by Fred B. Wheeler, Jr., entitled "Managing Instructional Information: A Decision Support System to Aid in Textbook Selection." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Curriculum and Instruction.

E. Dale Doak, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Vice Provost and
Dean of The Graduate School

MANAGING INSTRUCTIONAL INFORMATION: A DECISION SUPPORT SYSTEM TO AID IN TEXTBOOK SELECTION

A Dissertation

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Degree

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ABSTRACT

The purpose of this study was to examine the feasibility of developing a decision support system--a set of computerized information management tools to collect, store, analyze, and report information--to aid in the selection of classroom textbooks. The study was designed to assess the economic, technical, and operational feasibility using a management information systems model. A textbook selection decision was regarded as a combination of both operational control and managerial control decision types, semistructured in nature, requiring a wide range of data having specific information characteristics.

Working in a rural North Carolina school system, three administrators, twelve special education teachers and four computer science teachers were interviewed to determine the information they felt should be analyzed in selecting textbooks. Using data flow diagrams developed from the interviews, a decision support system was prototyped on an Apple IIe computer using the SuperCalc 3a program. Two textbook analysis sessions were held. The author functioned as a participant observor, providing and managing the computer system while the school personnel reviewed the match between the curriculum, exit exams, and textbooks, and evaluated the instructional characteristics of the texts.

The data showed that a decision support system was both economically and technically feasible, but was not operationally feasible because (1) curriculum objectives with specific classroom referents were not available, (2) very little instructional data was available as public knowledge, and (3) the information characteristics of the student background and achievement data--out-of-date, inadequate detail, low accuracy--were inadequate for application to the textbook selection decision.

As more detailed curriculum specifications and better quality student performance data are available in machine readible form, a computerized decision support system will become operationally feasible. Further research should concentrate on constructing more adequate analytical models that relate textbook content and instructional characteristics to student achievement. Then, the teachers in this study suggested, the system must be designed not only to help choose textbooks, but also to provide teachers information about the choosen book for use during instructional planning.

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CHAPTER 1

INTRODUCTION

A teacher faces a complex and difficult task: every student must learn a broad set of basic skills and academic competencies, yet each student brings a unique combination of cultural background, personal traits, and acquired abilities to the instructional setting. To teach successfully, a teacher must manage all elements of the instructional setting in such a way that learning is facilitated. Thus, many researchers have viewed teachers as instructional managers (for examples, see Berliner, 1983; Borko & Cadwell, 1982; and Doyle, 1983).

Two elements of instructional management have received particular attention: teacher planning and decision-making. Recent studies have provided new insights into the methods and information teachers apply to the planning and decision-making processes (Borko & Cadwell, 1982; Clark & Yinger, 1979; Joyce, 1978-79; and Morine-Dershimer, 1978-79). However, few studies have been done to indicate how teachers are to manage the information needed while planning or making decisions.

Textbook selection is an illustration of the managerial problems which become evident from studies of teacher planning and decision-making. Readability measures, skills

traces, and a variety of checklists can be employed during a survey of appropriate textbooks. Then detailed data about students and curriculum objectives can be applied to select the best match of curriculum, students, and textbook. Farr and Tulley (1985) report that there were between 42 and 180 items, with an average of 73 items, on the textbook criteria sheets they analyzed and declare, "The evaluation of a single textbook on so many criteria is certainly an overwhelming task" (p. 470). When several textbooks are to be examined, the information management problems involved in collecting, storing, analyzing, and reporting all that data are even more readily apparent.

Teachers as Managers

In attempting to insure that each student learns as much as possible, teachers must organize their classes into groups, choose appropriate materials and activities, implement instruction, and evaluate the results. In these circumstances, teachers' management skills are extremely important. Doyle (1983) observes that classroom management is a central part of teaching in classrooms, and Good (1980), in his review of what is known about teaching, reports that teachers' managerial abilities have been found to be related positively to student achievement. Thus Berliner's (1983)

assertion that teaching can be improved if teachers are viewed as managers or executives seems very reasonable.

Teacher Planning

A number of researchers have shown that teachers do not focus on instructional objectives during classroom planning; instead, they focus on subject content and instructional tasks. Rather than state objectives, develop alternative strategies, and choose the optimum alternative, teachers elaborate on the content and activities presented in the textbook (Clark & Yinger, 1977; Duffy, 1982; Joyce, 1978-79; Morine-Dershimer, 1978-79; Shavelson & Stern, 1981). The main element in teachers' plans is the classroom task: the set of resources, procedures, and products that make up the student assignments (Doyle, 1983).

Yinger (1977) developed a model of teacher preactive planning that proceeded at levels--yearly, term, unit, weekly, and daily. Because of teachers' task orientation and the importance of textbook materials within that framework, the yearly planning level is the most critical. Joyce (1978-79) summarizes this by stating:

> Relatively early in the year, most teachers set up a series of conditions which were to be powerfully influential on the possibilities of decision making thereafter. Lesson planning, to the extent that it goes on consciously, involves the selection and handling of materials and activities within the framework that has been set up by the long-term decisions. Perhaps this is why

> investigations of teacher lesson planning . . . have found that teachers plan lessons in terms of activities and arrangements for these activities rather than using objectives/activities/evaluation paradigms favored by most theoreticians of instructional design. . . . In effect, the selection of materials and the subsequent activity flow established the "problem frame"--the boundaries within which decision making will be carried on. (p. 75)

Teacher Decision-Making

The central importance of decision-making in the educational process has also been recognized. Hunter (1979) suggests that teaching is "the process of making and implementing decisions, before, during, and after instruction, to increase the probability of learning" (p. 62). This decision-making process is frequently divided into two stages. The preactive stage includes all decisions made prior to the implementation of instruction. The interactive stage encompasses all decisions made during the actual implementation of instruction.

The two stages of decision-making are related by the information the teacher carries between them. Bolster (1983, p. 294) claims that teachers "function consistently as situational decisionmakers" whose knowledge of the instructional process is derived and validated from their specific classroom experiences. Borko and Cadwell (1982) demonstrated this viewpoint in an investigation of individual differences among teachers' decision-making strategies.

The authors concluded that teachers' judgments and decision policies were essentially idiosyncratic--each teacher selected and weighted a unique set of information when asked to make decisions based on a detailed description of particular instructional problem.

In order to manage the classroom environment, teachers rely on two simplifying procedures. First, they develop routines to reduce the complexity and increase the predictability of classroom activities (Yinger, 1977). Secondly, they group students and use the group, rather than each individual student, as the planning unit (Shavelson & Stern, 1981). Thus, teachers accumulate a knowledge of the unique circumstances of their classrooms during the interactive instructional process; then the teachers carry this knowledge into the preactive decision-making stage. The curriculum materials and activities chosen become the framework which bounds further instructional decision-making.

Textbook Selection

Because the textbook serves as the operational framework for 85-90% of American teachers (Duffy & Ball, 1983), textbook choice is the most critical decision made during the preactive planning stage. Shavelson and Stern (1981) assert that "once a curriculum has been selected, teachers accept the textbook as the major, and usually the only

source of content" (p. 478). Doyle (1983) adds that textbooks and workbooks "carry the academic task system" (p. 187).

Given the importance of selecting a textbook, it might be assumed that there would be a set of well defined procedures for describing a class of students, analyzing a set of alternative textbooks, and selecting a textbook that effectively helps students achieve curriculum goals. Unfortunately, most research indicates that there is no reliable set of procedures to choose textbooks.

As a consequence, textbooks may be inappropriate for the classes in which they are used. There is often a serious mismatch between the readability of textbooks and the reading achievement level of the students required to learn from these books. In one study, Jorgensen (1978) found that over half of a class of third grade reading students were working below their instructional level, while 85% of the students in a fifth grade social studies class were being asked to work in materials that were above their instructional level. Shoreman (1982) found a significant increase in comprehension for all students when the material in their sixth grade social studies text was rewritten at a fourth grade readability level. Finally, Brunson (1980) found that many university education majors were not able to read at the level required by their textbooks.

Secondly, there is no clear congruence between the curriculum objectives expressed by educators, the textbooks used by children, and the tests used to measure achievement. Armbruster, Stevens, and Rosenshine (1977) studied the content of three reading curricula and two standardized tests at third grade level. They found that the overlap between texts and tests was low; the teachers and classwork emphasized comprehension skills while tests concentrated on factual recall of items found in text. Freeman, Kuhs, Porter, Knappen, Floden, Schmidt, and Schwille (1983) analyzed the overlap between textbooks and achievement tests in fourth grade mathematics programs. They found that the common core of topics covered by all texts and tests amounted to less than 50% of the total material; thus a fourth grader will be tested at the end of the year on a substantial amount of material that will not have been covered in class.

Finally, the classroom tasks required by textbooks are frequently not well suited to the students. MacGinitie (1976) demonstrated that textbooks often make inappropriate logical inference demands upon kids: steps in instructions that seem logical to adults may make little sense to six-year-olds. McConkie (1977) notes that "the cognitive representation of material presented by text is partially determined by prior learnings" (p. 13). But, aside from placing students within the grade level system, little

attempt is made to be sure students have the required background for understanding the textbooks. Hence, many students are forced to work without the domain-specific knowledge needed to learn from their text materials (Edge & Friedberg, 1984; Resnick & Ford, 1981). Brophy (1982) sums up the problems by stating:

> Good curriculum materials will work reasonably well for the mythical average student, but they will not work perfectly for any student and will not work at all for many. (p. 12)

Managing Instructional Information

The problems of using textbooks in classrooms are the result of the different sources of information used for curriculum development and instructional implementation. In a study of knowledge use in schools, Amarel and Chittenden (1982) note:

> Rarely, however, is knowledge intrinsic to the classroom regarded as a prime source for program development. In contrast, program implementation necessarily depends on knowledge sources that are intrinsic to the classroom, particularly knowledge about students and their responses to curriculum events and materials. (p. 3)

The attempts of textbook developers to bridge this knowledge gap have generally been unsuccessful because measures of text readability and student reading level are too imprecise to allow accurate matching of text and students (Bristow, Pikulski, & Pelosi, 1983; Sprague, 1968). Additionally, as discussed in the preceding section, many factors besides

readability must be considered in selecting text materials. Thus, Zecchini (1983) found that two highly regarded measures of student reading achievement were of limited value in predicting the appropriate placement of students in basal text materials.

The dualism of knowledge sources probably contributes significantly to the lack of agreement of exactly who is to make curriculum and textbook decisions. Kunder (1976), in a review of textbook selection procedures for the Educational Research Service, found wide variations in both textbook selection procedures and selection criteria. However, in many school systems, mechanisms existed to allow teachers a direct voice in the selection of text materials to be used in their classrooms.

However, it is unclear if teachers are able to gather and apply the information needed to accurately select text materials for their classrooms. Flemming (1983) found that the most frequently used source of information about textbooks was personal examination and the most important criteria for selection were related to reading level and motivational characteristics of the materials, but he reports no evidence of rigorous data collection or analysis. Byers and Evans (1980) found that teachers could not judge students' reading preferences because of a lack of reliable information about student interests. And Keck (1976) found that

teachers were generally unsophisticated in their information management skills--many teachers were unfamiliar with the variety of techniques available for data collection and management and instead relied upon their general impressions and intuition.

Thus, a system for the collection, storage, analysis, and reporting of information relevant to textbook selection may be of significant value to teachers. Such a system would allow the efficient determination of an appropriate textbook for each of the teacher's classes.

Statement of the Problem

The current procedures for textbook selection are inadequate due to a lack of a system to collect and use information about appropriate textbooks and students. There is information about alternative textbooks and about the students who make up a class, but teachers are unable to gather and apply that information easily. The collection, storage, analysis, and reporting of information relevant to textbook selection thus represents a significant problem in many educational institutions.

Purpose of the Study

The purpose of this study was to examine the feasibility of developing a set of computerized information

management tools to collect, store, analyze, and report information relevant to the selection of classroom textbooks. The tools included a data base management system specifically designed to manipulate information deemed important by the teacher, a set of utility programs to collect data on textbook readability and class characteristics, and a report generator to present the results of the analyses in an efficient format.

To examine the feasibility of using these tools, this study was designed to determine:

1. If a group of teachers could precisely specify the data they wanted to collect and analyze.
2. If the specified data could be collected and entered into a computer data base management system.
3. If the quality of the available data could support a computerized data base management system.
4. Which data structures would be required to manage the data.
5. If microcomputers currently available in schools have sufficient power to search, select, combine, and format the desired data.
6. What financial and personnel costs would be required to develop and use such a decision support system.

Scope and Procedure

To examine the feasibility of using these computer based tools, the author worked with teachers selecting textbooks in the Cherokee County, North Carolina, Public School System. The author--acting as a participating observer--provided a set of computerized decision support aids to help analyze textbooks available for special education reading and high school computer science classes.

The author began by using a structured interview to determine the information the teachers and system administrators felt would be important in making their selection of text materials, the queries the individuals might make when using the data base management system, and the report formats desired. Then the author analyzed the availability and quality of data required to analyze texts in terms of the needs expressed by the teachers and administrators.

The results were developed into a set of diagrams showing the logical flow of information through the decision points involved. These illustrations, called data flow diagrams, summarize the storage, processing and movement of data and serve the same purpose as an architect's preliminary sketches--the diagrams simplify communication between a decision support system developer and the potential users, and serve as a basis for the more detailed plans that follow

(Davis, 1983). In this case, the data flow diagrams were used to refine the data analysis.

Next, the data flow diagrams were used to develop the data structures and data management functions required by the decision support system. Available computers and data base management programs were reviewed to determine a suitable combination, and a set of data base management templates was constructed to meet the needs of the teachers as closely as possible. Other necessary utility and report programs were also selected. The financial and personnel development costs of the equipment and programs were determined.

The textbook selection committees used the templates and associated programs while the author recorded the personnel time necessary to analyze the textbooks. Teacher reactions were also noted. The total process was then reviewed in order to determine the fitness of the decision support system on each of the six dimensions of feasibility.

Assumptions of the Study

Several assumptions underlie the purpose and design of this study. First, the concepts of information management--the operations of collecting, organizing, storing, and analyzing data--are assumed to be broad enough to be applied in

a wide variety of instructional situations. In particular, the management of instructional information was regarded as analogous to the management of much business information: the tasks of teachers were considered comparable to the tasks performed by many business managerial employees.

Secondly, it was assumed that the formalization of information management procedures within the decision-making tasks of teachers would result in better instruction delivered to the student. It seems apparent that if the process of textbook selection is better understood, and that if information about textbooks and students can be more accurately collected and applied, then the instruction received by the learner will improve.

Finally, while an information management system does not necessarily require a computer, it is assumed that the availability of powerful microcomputers should enhance the capabilities of an information management system. Generally, the management system described requires relatively little computer time on a type of system that is becoming increasingly common in the schools. And while many people might question the assumption that teachers would be willing to use a sophisticated computer system, a survey of teachers showed that they would be interested and willing to use a

computer if a "user-friendly" system of significant instructional value is available (Instructor, 1982).

Limitations and Delimitations

This study has been limited to the development and analysis of the tools necessary for the management of information relevant to the process of selecting textbooks. Although there is information relevant to other aspects of the instructional process which is also difficult to manage, and such information might be amenable to inclusion in a broadly based management system designed to support teachers as they make other decisions, the magnitude of such a project was beyond the resources of the current study.

Additionally, this study has been limited to the construction of a decision support system which can be supported by commercially available programs; such programs are widely available and can be adapted to support a wide range of activities. These programs have been developed for use by individuals with little previous experience with computers and many include tutorials which help train users. Thus, teachers are faced only with the task of tailoring a management system to their needs rather than with the huge task of writing a program of their own.

CHAPTER 2

REVIEW OF LITERATURE

Choosing a textbook requires that each text be examined in light of specific selection criteria and that the information gathered be managed so that a choice can be made. This chapter presents a review of the educational literature describing textbook selection procedures and criteria; then a brief survey of management information systems research indicates how the concepts of information management for decision-making may be applied to the textbook selection process.

Textbook Selection Procedures

Currently, there is little uniformity in the formal procedures used for textbook selection. Kunder (1976), Goldstein (1978), and Farr and Tulley (1985) detail the variety of different procedures:

--22 states are classified as adoption states while 28 states leave textbook selection entirely to local school districts.

--Among the 22 adoption states, some specify a single text for each subject while others specify a short list of texts from which local districts may choose.

--Variety is again the rule where local districts have a choice: although a committee is usually formed to review textbooks, there is a wide variety of committee structures, responsibilities and procedures.

--Occasionally an individual, such as the district superintendent or a school principal, will make textbook choices with only informal discussions with a few selected teachers.

--Many school districts have no written textbook selection policies.

--Teachers are split almost equally between those who have and those who have not participated in the textbook selection process.

Despite this apparent diversity, the vast majority of textbooks are reviewed by some form of local school district textbook selection committee. Almost all adoption states have procedures of one kind or another that allow local districts to review and choose from several texts, while most nonadoption states provide some form of curriculum outline which local districts are to use as a guide when selecting texts (Farr & Tulley, 1985; Goldstein, 1978). Thus a local committee, following state and local requirements, serves as the focal point of most textbook selection procedures.

Teachers are generally well represented on local textbook selection committees, comprising a majority of the members in many cases (Goldstein, 1978; Kunder, 1976). While many times these committees act only in an advisory capacity, the fact remains that teachers are given a large voice in the review of the textbooks to be used in their classes.

Almost inevitably, these committees use a single method to evaluate the text materials. Publishers and local researchers rarely have an opportunity to perform the pilot studies that could provide learner verification data on the effectiveness of specific textbooks (EPIE, 1980). Instead, checklists of factors considered important are used to guide the evaluators as they review the materials. The committee may use a checklist obtained from state or local authorities or may develop its own form. The items on the checklist represent the selection criteria by which each textbook will be judged.

Textbook Evaluation Criteria

Again, there is little agreement on the formal criteria on which textbooks should be evaluated. Kunder (1976) provides samples of forms used by local committees in various school districts in the United States. One district has developed procedures for piloting textbooks while another

uses a simple one-page form rating each text from poor to excellent on a total of five dimensions. Some districts use multipage forms requiring detailed counts of the race, sex, and activities of all individuals pictured in the texts. Other districts completely omit any reference to racism or sexism in texts.

Farr and Tulley (1985) examined 70 forms used by selection committees in both adoption and nonadoption states. The sheets varied from 42 to 180 items in length, with an average of 73 items; the only item common to all 70 forms was the textbook copyright date! Generally, the forms studied asked only for confirmation of the existence of each factor rather than for an evaluation of the quality of the text on each factor. Farr and Tulley concluded that such evaluations are far too long and complex to be realistic.

In fact, the use of these criteria sheets is far more complex than indicated. Many criteria sheets ask for some form of content analysis. A comparison of the textbook with the appropriate curriculum objectives of the state and local educational systems results in a summative evaluation--on a scale of 1 to 5, for example--filling single blank on the evaluation form. Deciding how well each of five textbooks covers as few as 20 curriculum objectives adds a considerable amount of work to the evaluation task. And then continuing, as many sheets do, by asking if the organization

and sequence of the textbook content is compatible with the state or local curriculum guide greatly increases the complexity of the evaluation.

Disagreements continue about the value of many of the items which are used by many selection committees. Spache (1978) states that it is the responsibility of evaluators to determine the readability of the textbooks they select and 73% of the sheets examined by Farr and Tulley included this factor. But Armbruster, Osborn, and Davison (1985) title an article "Readability Formulas May Be Dangerous to Your Textbooks" and caution against the use of such formulas! Muther (1984) advocates the use of a skills trace to examine how a series of textbooks treats an important topic, but none of the other analysts even mention the technique. Finally, the disputes over the proper goals and objectives of education regarding controversial topics such as evolution undermine the usefulness of conventional content analysis of textbooks.

It is evident that evaluating text materials carefully is a time consuming task. But EPIE (1976) reports that teachers spend only three to ten hours a year selecting materials and even less time analyzing the instructional effectiveness of those materials prior to choosing them. Teachers serving on textbook selection committees may spend more time than this, but increasing the amount of time

available to teachers for evaluating materials is a major recommendation of textbook specialists (Farr & Tulley, 1985; Komoski, 1985).

Under these circumstances, the ability of teachers to gather and process all of the information needed to evaluate text materials is extremely limited. As a consequence of their information processing limitations, teachers must selectively perceive and interpret portions of the available information with respect to their own goals; they must construct a simplified model of reality which they then use to make their decisions (Shavelson & Stern, 1981).

Obviously, no single algorithmic procedure exists to guide committees selecting textbooks. A decision-making procedure that conforms to formal reasoning methods requires a clearly specified goal and that every conclusion follow from previous information using strictly prescribed rules; the decision-making procedures used in textbook selection originate from poorly specified goals and require drawing conclusions from incomplete information and from information which cannot be represented in concise statements. Hence, it is not possible to program a computer to choose the proper textbook; rather, given the constraints apparent in textbook selection procedures, a method of simply helping teachers manage the information necessary to evaluate text materials would be of significant value. The field of

Management Information Systems (MIS) has examined many of the problems involved in handling information to be used in business decision-making; thus, examining the concepts and research of MIS may prove fruitful.

Decision Types and Information Management

The types of decisions workers make, and thus the kind and quality of information they need, is determined by the level at which the workers operate. While managers may simply use whatever information is available, a more precise specification of information needs and decision-making processes is required if computerized information management systems are to be used. However, the system designer cannot just ask a manager what information will be needed--rather a dialog of analysis, discussion and observation is required (Bentley & Forkner, 1983).

The American workforce is often pictured as a hierarchy with numerous workers on the bottom and fewer managers at the top. Within the hierarchy, a flexible task classification framework characterizes managerial roles by level: low level managers are concerned with the operational control of daily activities, middle level personnel are concerned with generalized management control decisions and top level managers are concerned with policy making and strategic planning (Anthony, 1965; Carlson, 1983).

Teachers have an unusual set of work roles. Not only are they the essential workers at the operational level--responsible for the implementation of the daily activities of instruction--but they also share responsibility for many of the tasks traditionally assigned to managers. Montello and Wimberly (1975) note that

> The manager of an educational enterprise is a decision-maker and must have information in order to function. Such an educational enterprise may be any unit, ranging from the smallest self-contained classroom with the teacher as manager up to the largest school district in its entirety. (p. 15; emphasis added)

The American public and district school boards and superintendents represent the top management level, concerned with deciding system goals and strategies and with providing the resources needed to reach those goals. Principals, supervisors, and teachers make the operational control decisions, guiding the daily activities of the schools. All groups share the managerial control decisions.

Anthony (1965) defines managerial control as "the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives" (p. 27). The selection of text materials represents a key managerial control decision because it translates the goals and strategies articulated by the top managerial level into resources and plans for the daily operational activities of the workforce. Text

selection also can be considered an operational control decision because the textbook provides the content and central instructional activities for most classroom interactions. Thus the choice of a textbook represents the dilemma of a combination decision type: school administrators may view textbook selection as a way to achieve relatively consistent educational quality throughout the system while teachers judge texts on the basis of the appropriateness of the tasks provided for their specific classrooms. The managerial level of the decision-makers influences their view of the decision.

An essential characteristic of the decision level is the degree of structure governing the decision-making process (Simon, 1960). An operational decision is generally highly structured--the operating procedures, decision rules, and information flows can be reliably predefined. At the other extreme, the goal and strategic decisions made by top management may be considered examples of unstructured decisions--the problems involved are complex and highly judgmental, and unforeseeable issues make information requirements unpredictable. The intrinsic structure of operational control and managerial control decisions fall between these two extremes--such semistructured decisions have elements which are susceptible to operational analysis and elements requiring the subjective judgment of a manager (Keen &

Morton, 1978). Table 1 illustrates this continuum of decision types and structure using examples from banking and education. The type of decision to be made dictates the characteristics of the information needed (Awad, 1977). Operational decisions can usually be based upon a reasonably well articulated rule applied to the intrinsic data immediately available, while strategic planning requires the application of a wide range of data extrinsic to the operational environment. Again, operational control and management control decisions fall somewhere between these extremes. Table 2 (adapted from Keen & Morton, 1978) outlines the information characteristics required by each decision type.

TABLE 1

RELATIONSHIP BETWEEN DECISION TYPE AND STRUCTURE

DECISION TYPE	DEGREE OF STRUCTURE	BANKING DECISIONS	EDUCATIONAL DECISIONS
Operational	Highest structure	Customer withdrawal	Individual tutoring
Operational control		Number of tellers	Daily lesson planning
Managerial control		Investment allocations	Teacher work rules
Strategic planning	Least structure	Target rate of return	Curriculum goals

TABLE 2

DECISION AREA AND INFORMATION CHARACTERISTICS
(ADAPTED FROM KEEN & MORTON, 1978)

DECISION AREA	INFORMATION CHARACTERISTICS				
	SOURCE	DETAIL	ACCURACY	AGE	SCOPE
Operational procedures	Internal	Highly detailed	High	Current	Narrow
Operational control	↕	↕	↕	↕	↕
Managerial control	↕	↕	↕	↕	↕
Strategic planning	External	Aggregate	Low	Older	Wide

Examining Table 2, we can see that combination operational control/management control decisions such as selecting text materials for classroom use will require information from external sources to meet the needs of the management control aspect of textbook selection--for example, information from outside the school system relevant to the curriculum goals and system resources will have been applied to the development of the curriculum objectives, test competencies, and financial means which will guide the selection process. Additional information is also needed from sources internal to the school system in order to examine the operational control aspects of the textbook selection decision--

primarily information describing students, instructional techniques, and instructional activities which are appropriate to the school.

Table 2 also demonstrates the range of detail needed. Although much of the information must necessarily be aggregated into composite data such as competency indicators of curriculum goals and statistical summaries of student performance, considerable operational detail is also necessary. For example, a statistic indicating the average reading achievement level of a class may be sufficient for managerial control decision-making yet may be inadequate for operational control decision-making by obscuring the actual distribution of student scores. The accuracy and the currency of the information must also reflect both the managerial and the operational level of the textbook selection decision; information used to support the strategic planning process does not require the same accuracy and currency standards.

Decision-making theory emphasizes that a broad range of information must be available (Kroeber & Watson, 1984). Information about how well the text materials meet the curriculum objectives, statistics matching student and text characteristics, opinions on the suitability of the text for particular sets of students--each text must be evaluated on many dimensions if an adequate decision is to be made. Yet despite the amount of information which must be gathered and

considered, managerial judgment will be necessary in making the final selection; the problem is still too complex for the development of a simple decision-making rule that can be easily applied under all circumstances.

Decision Support Systems

Decision support systems (DSS) represent an approach to using computers as an aid to making semistructured decisions such as textbook selection. A DSS is a computerized information management system, under the control of the decision makers, that provides access to data, models and analytical aids relevant to specific decision-making tasks (Kroeber & Watson, 1984). Such a system is designed to support managerial judgment rather than replace it.

Two factors require that a DSS be under the control of the specific individuals who will use it. First, the differing situational factors surrounding each manager lead to differing information needs. Secondly, differing decision styles will lead to differing information analyses. Hence, information can only be defined in terms of a specific user. Davis (1983) states:

> Information is data that has been processed into a form that is meaningful to the recipient, and is of real perceived value in current or prospective decisions. (1974, pp. 16-17)

Under these circumstances, the emphasis of DSS designers has been to involve the user as early as possible in the design cycle and to construct a system that readily responds to the users' needs (Keen & Morton, 1978; Hurst, Ness, Gambino, & Johnson, 1983).

Figure 1 illustrates the main components of a decision support system. Users are able to analyze a collection of data by using a computer program designed to collect and organize the data in terms of a decision model constructed specifically for--and often with the help of--the users themselves.

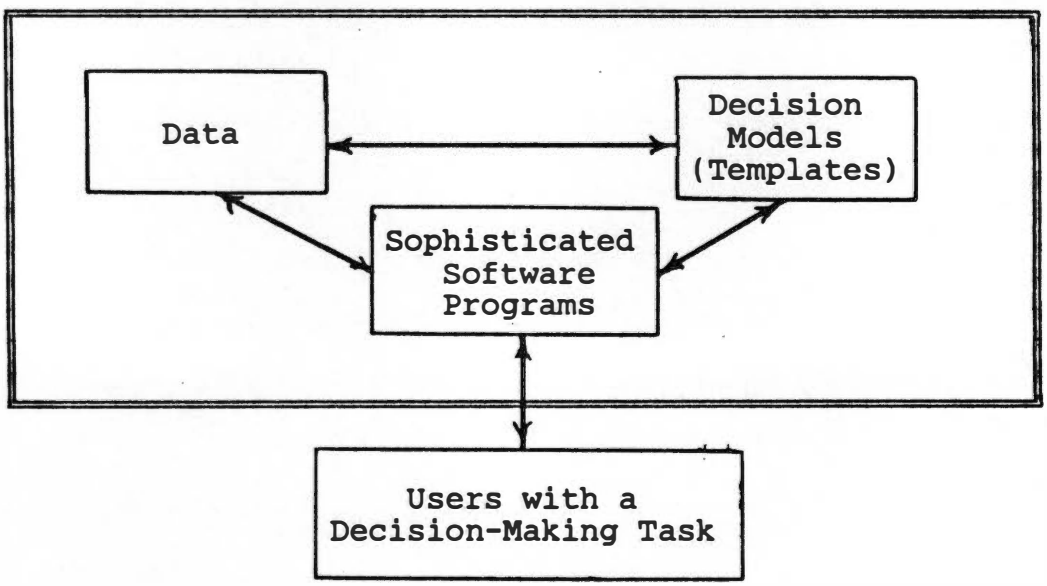


Figure 1. The basic components of a decision support system (adapted from Kroeber & Watson, 1984).

Bennett (1983) defines a DSS model as "an embodiment of the decision maker's own evolving view of those elements thought to be important for the decision under consideration" (p. 10). Creating such models is now possible through the development of both powerful microcomputers and easy to use information management programs. A DSS developer tailors an information management program to the users' needs by developing a template that specifies the data to be collected, the format of the data and the relationships between each data element. This template is a model, created for general use, that organizes the data so that the users can perform any analyses that seem relevant to the decision at hand.

The data can be obtained from many different sources: an organization's transactional data may be available, but more often the user enters summary data developed from both public and private knowledge. Averages of hard data, predictions based on statistical analyses, and personal estimates and evaluations may all be used in a single template. The software then allows the user to combine, sort, select, and report the data as desired.

Decision Support Systems and Textbook Selection

The choice of a textbook would appear to be an excellent candidate for a decision support system. A traditional

data processing system--which provides a predetermined output for any given input--cannot be used because there are no algorithms for choosing textbooks based on student performance. A management information system, which summarizes the daily operational data for strategic planning, cannot be used because much of the information relevant to textbook selection is obscured in highly condensed summaries such as class reading achievement average.

In designing a decision support system for the textbook selection process, an exceptionally broad model (or set of templates) will be necessary to satisfy the needs of a committee representing two different management levels. Yet a system designed to support a wide range of models may be of aid in a difficult and time-comsuming task.

CHAPTER 3

RESEARCH PROCEDURES

The textbook selection process in Cherokee County, North Carolina--where this study was done--is complex and very labor intensive; over the years, a procedure has evolved to manage the selection tasks. It was necessary to plan the research project so that the computerized DSS could be designed and its usefulness determined without disrupting the established system. This chapter describes the local setting and procedures, describes the research plan, and details how data were gathered and applied to determining the feasibility of a DSS for textbook selection.

The choice of a topic frequently mandates a particular research design. The analysis of a semistructured decision such as textbook selection, in a discipline as complex as teaching, requires special research procedures. The design must allow the decision-makers to define the information, processes, and heuristics which are to be used while permitting the researcher to observe the interaction between those decision-makers and the computer based information management system (Bennett, 1983; Keen & Morton, 1975).

The Research Setting

Cherokee County is a rural mountain country in the far western tip of North Carolina. Murphy, with a population of approximately 2,000 residents, is the county seat and largest town. The Cherokee County School System is comprised of six elementary schools, one junior high school, and three high schools with a total student population of 3,600.

North Carolina is a textbook adoption state which purchases all textbooks and then distributes them to each of the counties. The State Department of Public Instruction does not specify a single text for each subject, but rather a short list of approximately five books; the school personnel from each county can then make their choice from the textbooks on that list. In fact, county personnel can choose more than one book for a single subject area as long as each book is ordered in classroom sets of approximately 25.

School personnel in each of the North Carolina counties develop their own textbook selection processes. Although there are no written procedures, the Cherokee County administrative staff has asked all teachers who will be using a textbook to examine each of the books on the list from the state and then vote for the book of their choice--the choice of the majority is then adopted for the county schools. The specific steps involved are:

1. When asked by the Department of Public Instruction, county teachers participate in the initial state screening of textbooks as local readers who follow state evaluation procedures. Thus, there are a group of teachers who are experienced in textbook selection and familiar with most of the materials available.

2. After the state department issues the new list of approved textbooks for a specific grade and subject and calls for local orders, the director of instruction meets with the principals to determine a selection schedule, a supervisor for each area, and any special procedures that might be appropriate.

3. The supervisor distributes the textbooks so that they circulate among the teachers for inspection.

4. The supervisor brings a general list of the appropriate curriculum objectives to a working meeting of the teachers who will be using the book chosen. The group examines each textbook for its coverage of the curriculum objectives and discusses the book's suitability for use in their classes. No specific analysis is followed, no checklist or rating form is used, and no specific reports are developed.

5. The teachers return to their schools; they continue to examine and discuss the books for another week. Then their votes are forwarded to the director of instruction who

determines the choice of the majority and orders the textbooks.

This procedure is very involved and time-consuming. Each year, textbooks for up to 12 grades in three or four subject areas are chosen. The distribution of materials, scheduling of meetings, and the management of even the minimal amount of paperwork necessitated by these procedures is a significant burden on the school personnel. The administrators and teachers involved immediately saw the potential value of a computerized information management system.

However, the administrators were unwilling to experiment directly with the established procedures: the problems of developing and installing a computer system are well known and any interference with the current procedures could be very expensive in terms of the time and effort of the school personnel. Hence, a simulation of the normal procedures, involving the choice of textbooks in computer science and special education, was developed.

Simulation Procedures

A simulation is an operating model of a complex system; its validity depends upon the degree of realism apparent to the subjects and upon the degree of structural and procedural correspondence between the model and the reference system (Raser, 1969). Examining the selection of textbooks

in computer science and special education simplified the process by eliminating the constraints placed by North Carolina--no approved lists of texts have yet been developed in these areas. Thus, there was no state imposed time frame for selecting texts, nor any requirements on the number of each textbook which had to be ordered. The restriction to these subject areas also provided economy by limiting the process to three administrators and twelve special education and four computer science teachers. Significantly, given these simplifications, there would be little extra expense involved if problems developed with computer-based information management system.

The computers were readily available to all teachers. More than 70 Apple II+ and IIe computers had been purchased by the school system and were placed in all schools. All of the machines had at least one disk drive and the majority of the machines had 64K of internal memory. Almost all of the system teachers had taken a course designed to introduce teachers to the operation and major classroom uses of these computers.

The teachers involved were all familiar with, and most had participated in, the normal textbook selection process. To insure the validity of the simulation, the research procedure followed the normal textbook selection procedures in

the following manner (steps marked "**" represent the additional steps required by the introduction of the DSS):

1. An initial review reduced the number of textbooks to approximately five in each of the subjects under consideration. While none of the state checklists were involved, the procedure was similar to the initial screening provided by local readers.

2. The researcher met with the director of instruction and with the director of special programs to establish that each director would supervise the appropriate text selection process, to set the schedule, and to work out a procedure that included the computer-based DSS within the normal process.

3. The potential text materials were selected from the teachers' collections and from the North Carolina regional materials center and circulated among the teachers.

** The researcher discussed with the teachers the information they felt would be useful in making a selection, the format in which the information should be arranged and the reports they would like as summaries of their analyses of the textbooks.

** The researcher obtained the curriculum and student data (with student names deleted) the teachers requested and built a computerized database. This initial database described the course curriculum objectives, the course topics,

the exit exam competencies, the student reading achievement levels, and other asked for data. The data were formatted according to the teachers' suggestions.

4. The supervisor and teachers met for a working session to analyze the textbooks.

** At this session, the researcher provided the initial database and information management system so that the data collected about each textbook could be entered into the database.

** After the working session, the researcher and the supervisor produced the computerized report summaries requested by the teachers.

5. The teachers returned to their schools, received the reports, discussed the texts, and made their choices.

** The researcher questioned the participants on their view of the system to complete collection of the data required by the research questions.

Thus, the simulation maintained the structure and procedures of the regular textbook selection process except for the addition of the computer-based DSS and the presence of the researcher as a participant observer.

The Participant Observer Design

In this study, participant observation was a requirement of the information management development procedure.

No general method has been developed to guide the textbook selection process; much of the knowledge teachers apply to the selection process has been developed from personal analysis of activities in the teacher's particular classroom. Participant observation is a valid research technique for examining the application of this tacit knowledge (Bolster, 1983; Doyle, 1981; Rogers, 1984). Observing decision-makers as they use a prototype of the information management system provides the detailed data necessary to determine the feasibility of the system.

The author's participation was limited to determining what information the school personnel wanted to use during textbook selection, and to providing and operating the information management system prototype used during the pilot sessions. The author tried not to influence the information and analyses the school personnel used nor to change their normal textbook selection procedures. The interview and pilot session scripts, which were designed to limit the role of the investigator, are presented in the appendices of this report.

Prototyping: The Decision Support System Design Cycle

Prototyping--the construction of an experimental model used to gather information about system performance--is an

attempt to overcome the problems caused when an information system designer does not fully understand the user's discipline. Where possible, the design of a DSS should be done by the users themselves; when this is not possible, the DSS designed must involve the user in a planning cycle that requires an immense effort--perhaps as much as 70% of the total project time (Keen & Morton, 1975). The user must define the information, processes and heuristics that will be used during the decision-making process (Bennett, 1983; Keen & Morton, 1975; Kroeber & Watson, 1984).

The construction of computer-based information systems is particularly difficult in a discipline where knowledge is subjective, ill-codified, and partly judgmental. The knowledge of the decision-maker is rarely formulated in a fashion that permits a simple translation; some method must be used which allows the decision-maker to learn how to express his needs to the designer (Buchanan et al., 1983).

Prototyping is one method which helps overcome the problems of user learning by providing a concrete system with which the user can interact. By observing the interaction between the observer and the system, the designer can avoid the problems which arise when a system is imposed upon the user (Keen & Gambino 1983; Lee, 1985).

This design cycle must be recursive--the results of the initial prototype must be applied to the design of a new

prototype and the process repeated until the user feels the system is a valuable aid to the decision-making process. As Martin (1981) states, "The more thinking, iteration, and interaction with users that goes on before a data base is implemented, the better the final product will be" (p. 52).

The Feasibility Study

A feasibility study is "a compressed, capsule version of the entire systems analysis and design process" (Davis, 1983). The study must clarify the problem definition and determine if any computer-based solutions are possible--technologically, economically and operationally--before any major resources are committed to the project. For this study, six research questions were developed to analyze the feasibility of a decision support system for textbook selection.

Two questions focused on the technical feasibility of the system:

1. Could the information specified by teachers be stored in a file or data base management system available on a school microcomputer?
2. Did the available Apple IIe microcomputers have sufficient power to search, select, combine and format the desired reports of that data?

One question focused on the economic feasibility of the system:

3. What financial and personnel costs were involved in the setup and use of the decision support system?

Three questions focused on the operational feasibility of the system:

4. What data, data formats, and reports, if any, would a group of teachers describe as useful in selecting a textbook?
5. Were the characteristics and quality of the specified dataset appropriate for use in a textbook selection decision support system?
6. Did teacher responses while and after using a prototype indicate that the decision support system had enough functional value to make continued development feasible?

The data collected to resolve these six questions were used to establish the feasibility of the decision support system.

Data Collection and Analysis

The first stage of data collection utilized a structured interview with the teachers and administrators to determine the data, data formats, and reports they felt would be useful in analyzing text materials. This procedure

was used because it is difficult for managers to express their information needs in terms the decision support system designer can use; by presenting examples and probing responses the designer can obtain a reasonable initial dataset (Hurst, Ness, Gambino, & Johnson, 1983; Keen & Morton, 1978). The interview format covered a brief summary of the problem and related research, a series of examples of data and data formats that might be collected, and general discussion. The materials used are included in Appendix A.

The dataset obtained provided the information needed to construct the prototype, build a sample database, and use the decision support system for one test cycle. During this process all activities were timed in order to develop an estimate of personnel costs. Notes were kept on all observations of the individuals as they worked with the system. A final discussion after the cycle was complete then provided the basis for a revised dataset. This information was used to answer the six feasibility questions.

To answer the first question--Could the dataset be stored in a file or data base management system available for the Apple IIe?--the number of items to be stored, the character length of each item, and the total character length were determined for the dataset specified by the teachers. These values were then compared with the maximum

values handled by the various file and data base managers available for the Apple IIe microcomputer.

To judge if the Apple IIe had sufficient power to search, select, combine, and format the desired reports, the data structure necessary to contain the information specified and the manipulations necessary to produce the desired reports were determined. Then those requirements were matched with the capabilities of the programs available for the Apple IIe.

To analyze the financial and personnel costs, the value of all computer equipment and programs that had to be added to the equipment currently in the school was computed. The number of man-hours necessary to specify, locate, enter, and produce the desired information was totaled. In this study, the implications of these costs were compared generally with the functional value of the system as reported by the teachers--no strict cost/benefit analysis was developed due to the difficultly of placing an economic value upon the results of the decision support system.

The answer to question 4--What data, data formats, and reports would teachers want?--was provided through the structured interview and the exit discussion.

To examine question 5--Were the characteristics and quality of the specified dataset appropriate for use in a textbook selection decision support system?--the dataset

suggested by teachers was examined in terms of the characteristics and qualities of information and in terms of the information needed to match textbooks to learners as indicated by the review of research in Chapter 2. To do this, each item in the data set was analyzed in terms of:

1. The component of the textbook selection process--objectives, test competencies, readability, student background required, or instructional characteristics (as described in Chapter 2)--the information addressed.
2. The source of the data item as intrinsic or extrinsic to local classrooms.
3. The level of aggregation of the item described as ranging from specific detail to broad summary.
4. The validity or accuracy of the item obtained from a review of the professional literature.
5. The timeliness of the data expressed as the age of the data in months.
6. The perceived relevancy to the textbook choice decision as expressed by the teachers after using the data base to help choose text materials.

After examining each item individually, the scope and completeness of the entire dataset was considered in terms of the problem of textbook selection. The purpose of this data item analysis was to evaluate the theoretical grounds

for maintaining that a decision support system could help teachers choose more effective classroom text materials.

Finally, to examine question 6, teacher responses to the usefulness of each component of the DSS were used to determine if teachers found enough value in using the computerized database to make further development feasible.

In summation, the data analysis provides a demonstration of the current feasibility of constructing a DSS to support teachers as they make textbook selection decisions. The analysis shows what is possible now and what technological and procedural changes will permit in the future.

The analysis was not designed to establish the actual value of the DSS to the participants. Since the prototyping process must be repeated several times before the system provides enough support to the decision-maker to stand on its own, this study aimed only at establishing the potential of a computer-based information management system to aid teachers in selection text materials.

CHAPTER 4

RESULTS, ANALYSIS, AND INTERPRETATION

The research data were collected in five separate phases. First, 19 administrators and teachers were interviewed, individually or in groups, to determine what information they felt would be useful in selecting textbooks. The results were used to develop data flow diagrams which modeled the information flow through the textbook selection process. A series of Decision Support System (DSS) templates and procedures were then developed from the diagrams. Next, these DSS templates and procedures were assessed during a pilot session to analyze text materials for special education reading instruction. Finally, a revised set of DSS templates and procedures were used to help select a textbook for a high school computer science program.

Figure 2 shows a flow chart of the research procedures, along with the objective of each phase. By constructing a prototype DSS based on the information needs of the decision makers themselves, and then refining and piloting the system during actual textbook selection proceedings, accurate system feasibility data could be gathered. This chapter reports the findings of each step and describes how the information from one phase was built into the next phase.

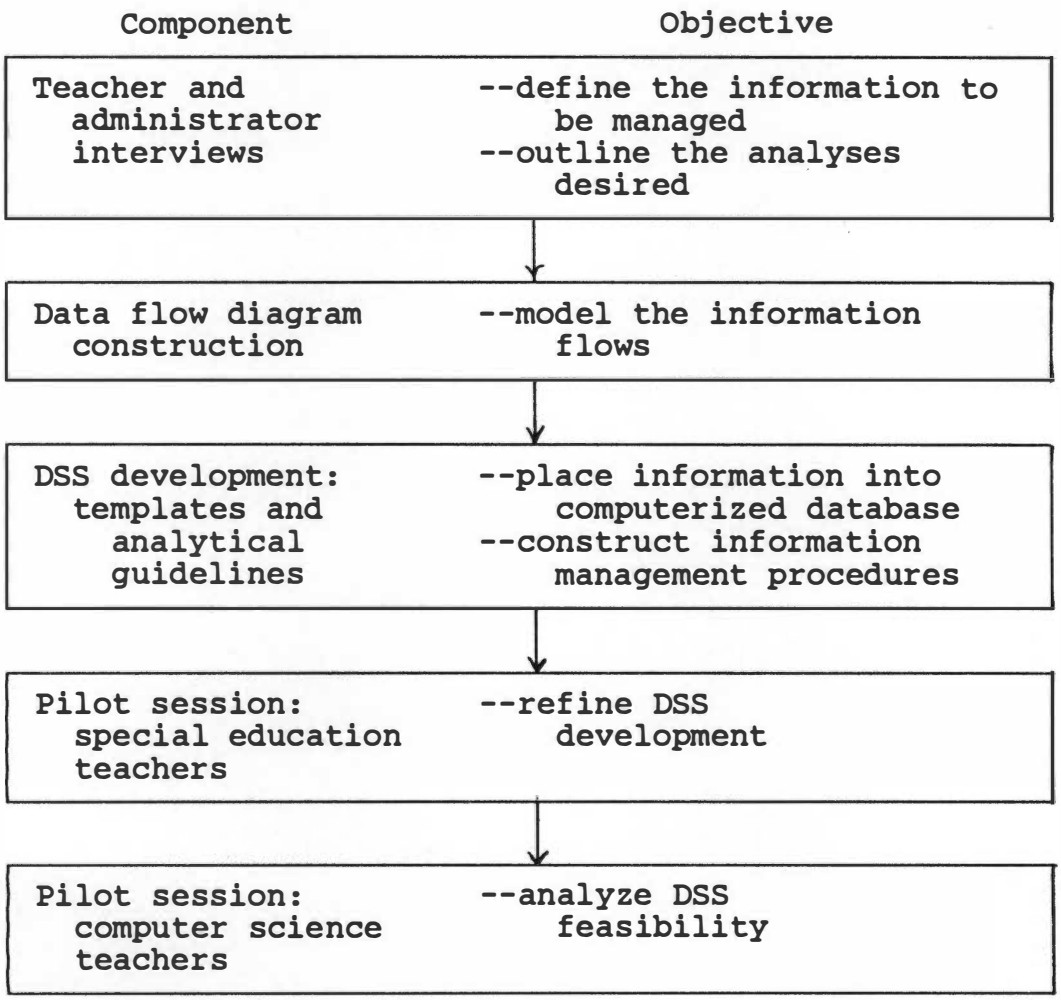


Figure 2. Research procedures.

The Interviews

The 19 individuals interviewed included three full-time administrators--the director of instruction, the director of programs for exceptional children, and a school principal--twelve teachers of exceptional children, and four teachers of computer science. (Cherokee County has no educational computing administrative position--one of the teachers handles any special administrative duties in addition to his full-time teaching responsibilities.) All were interviewed using the interview guide included in Appendix A.

None of the individuals used a formal checklist when selecting textbooks, although the director of instruction had a file of such forms. All 19 individuals felt that a computerized system might be helpful, but there were many differences in the DSS analytical tools desired. The results of the interviews are discussed below in terms of how to analyze textbook content; how to match textbooks with specific groups of students, and how to evaluate a variety of textbook characteristics.

Administrators

The major concern of the administrators interviewed was textbook content; a computerized template used to compare

the content of each text with the topics specified by the curriculum was the major DSS tool requested.

Content analysis. Each of the three administrators felt that the content of the textbook should be analyzed in terms of the North Carolina curriculum guide, Competency Goals and Performance Indicators, K-12 which outlines the student competency goals and performance indicators for each subject. In addition, all administrators felt that the competencies covered on North Carolina State mandated exit exams--the California Achievement Test for the elementary grades and the North Carolina Competency Tests of Reading and Math for high school--should be compared with the competencies developed by the textbooks.

Student attributes. The administrators were less interested in DSS tools that attempted to help match the textbooks with specific groups of students. Any attempt to match textbooks to specific student characteristics is complicated by the fact that the chosen textbook must be used for at least five years. The director of instruction felt that split adoptions--two or more different textbooks selected for use in different sections of the same course--were not particularly advantageous; thus one textbook for each subject and level was to be chosen for use over a five year period in all of the county schools. This precluded

matching textbooks to the reading or achievement level of a particular class. Thus, neither the director of instruction nor the director of programs for exceptional children needed any specific analysis of student characteristics during the textbook selection process. However, they were willing to include in the system any analysis teachers felt useful.

The other administrator, a principal, had used summaries of student performance on exit exams to analyze the effectiveness of the instructional program in his school--he thought these summaries might also be useful in selecting textbooks. But the test summaries would not be developed in time for use during the textbook selection process: the textbooks were generally analyzed and chosen between February and April while the achievement test results were not reported until May. Still, the principal wanted a DSS template that made previous test results available for each school and grade level to see if patterns in the data helped choose appropriate textbooks--if the results demonstrated that the data could be useful, future computerized systems might be designed to make the information available when needed.

Textbook characteristics. All administrators were interested in using computerized checklists to help evaluate the instructional strengths and weaknesses of each textbook.

They suggested a variety of factors which could be included in analyzing the texts. These suggestions paralleled those of the teachers, and frequently the administrators recommended that the specific factors included in the DSS system should be left up to the teachers themselves. Hence, the responses of the administrators have been included with the responses of teachers in Table 3, which is discussed on page 58.

Special Education Teachers

While the teachers of the mildly handicapped included in this study have many special instructional problems, they frequently must cover the same content and use the same textbooks as regular classroom teachers: generally their students face the same exit exams as the regular students and are to follow the same curriculum. The educational programs of Cherokee County students identified as "learning disabled" are to be based on the same North Carolina curriculum guide as regular students, while students identified as "educable mentally handicapped" are to follow a North Carolina supplemental guide that specifies much of the same material covered by regular students, including the complete set of learning objectives covered by the North Carolina High School Competency Exams. Thus the special education teachers must analyze the same set of textbooks as the regular classroom teachers.

TABLE 3

TEXTBOOK CHARACTERISTICS SUGGESTED

Textbook characteristic	Consider	Omit	Undecided
support for enrichment activities	15	2	0
supplemental materials	14	2	3
layout	13	3	3
illustrations	13	4	2
instructional qualities	13	3	2
amount of drill	11	1	1
production quality	10	3	6
interest level	9	4	6
content organization	9	6	4
maturity level	8	6	5
copyright date	7	10	2
explanation clarity	7	3	2
readability	6	7	6
publisher	6	11	2
comprehension by rural students	5	4	1

Content analysis. Although all special education teachers were familiar with the North Carolina curriculum guides, only two of the teachers indicated a need for analyzing textbooks in terms of the congruence between the textbooks and the guides. Instead, teachers wanted content analysis performed in terms of the objectives covered on the particular Brigance Diagnostic Inventory of Basic Skills used to develop each student's individual education program (IEP). In addition, all but three of the teachers felt that the competencies covered on North Carolina State mandated exit exams should be compared with the competencies developed by the textbooks; the other three teachers felt opposed to the idea of "teaching to the test" and so were not interested in comparing the textbook content with the exit exam content, although they still wanted to key the classroom content to IEP objectives developed from the Brigance. Thus, the teachers appeared less interested than the administrators in following a uniform curriculum guide and more interested in meeting specific student needs in terms of competencies which would have to be demonstrated at the end of the school year.

Student attributes. The special education teachers exhibited a variety of attitudes toward matching textbooks to specific student or class attributes. Six of the teachers felt that examining student reading achievement test

results would be useful in helping select textbooks. A few also wanted the achievement test results in all subjects made available by school and grade. About one-half of the teachers felt that frequent analysis of student attributes and performance would be helpful when analyzing textbook characteristics even though such student data might vary significantly over the textbooks' five year period of use. Some of the other teachers felt that the student needs varied so greatly over five years that an analysis of student attributes might be misleading; others simply felt it was unnecessary to match the textbooks to specific student traits.

Textbook characteristics. The teachers varied considerably in their suggestions of which textbook characteristics they felt should be analyzed when choosing a text and on how those items should be evaluated. Teachers were asked to suggest textbook characteristics which they felt should be included on a computerized checklist and were allowed to comment on the suggestions of other teachers. All suggestions were noted and were used to construct the textbook characteristics template.

Because the administrators and computer science teachers responses also varied widely, all suggestions were incorporated into a single template; thus the results for all interviews are reported together in Table 3.

Computer Science Teachers

Computer science is a relatively new subject in the North Carolina schools. There is no certification procedure for computer science teachers--each of the four teachers interviewed taught high school math classes in addition to computer science. Moreover, there is no North Carolina curriculum guide for computer science, and there is no list of approved textbooks. The computer science teachers could choose any text they wished, using any criteria they wished.

Content analysis. The computer science teachers agreed to use a simple outline of the topics they felt the course should cover; the teacher designated as computer coordinator developed the outline using the table of contents of his favorite programming book as a guide. None of the teachers interviewed expressed a desire for a North Carolina curriculum guide like those available for other school subjects.

Student attributes. The computer science teachers split evenly on the value of matching student characteristics to textbook attributes. Two of the teachers wanted to use the student preregistration lists to analyze the latest reading achievement test scores and the algebra class grades of the expected class. These teachers would then match the textbook reading level and the amount of algebra presumed to the average of the students. The other two teachers felt

that computer science texts should cover certain subjects, in a certain manner, and wanted students to meet the standards of the text selected according to their conception of a computer science class.

Textbook characteristics. Like the administrators and special education teachers, the computer science teachers varied widely on the textbook characteristics they wanted to analyze. For example, two of the computer science teachers attached great importance to the use of instructional techniques such as advance organizers and chapter summaries while the other two teachers felt that content organization and number of practice exercises were much more important. Again, all suggestions were incorporated into the textbook characteristics template; the specific responses are included in Table 3.

Interview Summary

The interviews indicated that each individual wanted to apply a unique set of evaluation criteria to the selection of a textbook. Hence a wide variety of analytical tools would have to be included in any useful DSS.

To analyze textbook content, templates would have to describe the content in terms of the North Carolina Competency Goals and Indicators to satisfy the needs of the system administrators, in terms of specific student skills to

satisfy the needs of the special education teachers, and in terms of course subject content for the computer science teachers. In addition, a template to analyze content in terms of exit exam competencies was desired by most teachers and administrators.

While there was no mandatory need for templates describing student attributes, sufficient interest was evidenced in the interviews to warrant the construction of a trial template describing student reading levels as indicated by achievement test scores; additional templates could be delayed until evidence of their value could be established.

The construction of a textbook characteristics template had to accommodate a wide range of analytical needs. Table 3 (p. 53) shows how widely all individuals varied on which textbook characteristics they felt were important enough to formally analyze. The responses of administrators, special education teachers, and computer science teachers have been combined because, given the small number of individuals interviewed, no major difference between the groups could be determined and because all characteristics were to be included in a single template. The lefthand column lists textbook characteristics suggested during the interviews by at least five individuals. The three other columns give the number of individuals who suggested or agreed that the item should be considered, who felt that

the item need not be considered or who were undecided. The table shows that there is no single item on which all the teachers and administrators agreed! While many were willing to go along with others in the group and include items they deemed unimportant, they would not use such items in their own analyses.

The variability indicated by Table 3 is only one aspect of the individuality of textbook selection approaches. Not only did teachers use different information in evaluating texts, they also used different weighting and scoring systems. At least five different scoring systems were suggested, plus "none of the above," and no more than five individuals agreed on any one of the six alternatives!

Interestingly, several textbook characteristics may actually represent a method of dealing with student attributes. Textbook characteristics such as "interest level," "readability," "maturity level," and "comprehensibility by rural students" may be attempts by teachers to relate textbook qualities to certain student traits observed in their classrooms even though formal measures of these student attributes are not available at the time of textbook selection or the traits may vary widely over the period the textbook use.

The Textbook Selection Process: A Data Flow Diagram

At this point, a summary diagram that shows both the textbook selection process and the information flow from step to step through the process was developed. A data flow diagram is a logical model of a process that is designed as a starting point for information system design (Eckols, 1983; Dolan, 1984).

Figure 3 is the context, or level one, data flow diagram of the textbook selection process. This diagram uses rectangles to indicate the external origin and destination of the information that shapes the procedures to be modeled: the North Carolina Department of Public Instruction begins this process by requesting textbook orders for specified subjects and grade levels. The department is also the destination of the final textbook order prepared by the local school district personnel. The outside "files" of information which are to be used during the process are indicated by open-ended rectangles; files drawn with solid lines have been used previously in the normal textbook selection process. The Department of Instruction supplies samples of approved textbooks and publishes the North Carolina Competency Goals and Performance Indicators for almost all subjects. The files drawn with dotted lines represent those files which are to be added by the computerized DSS: the

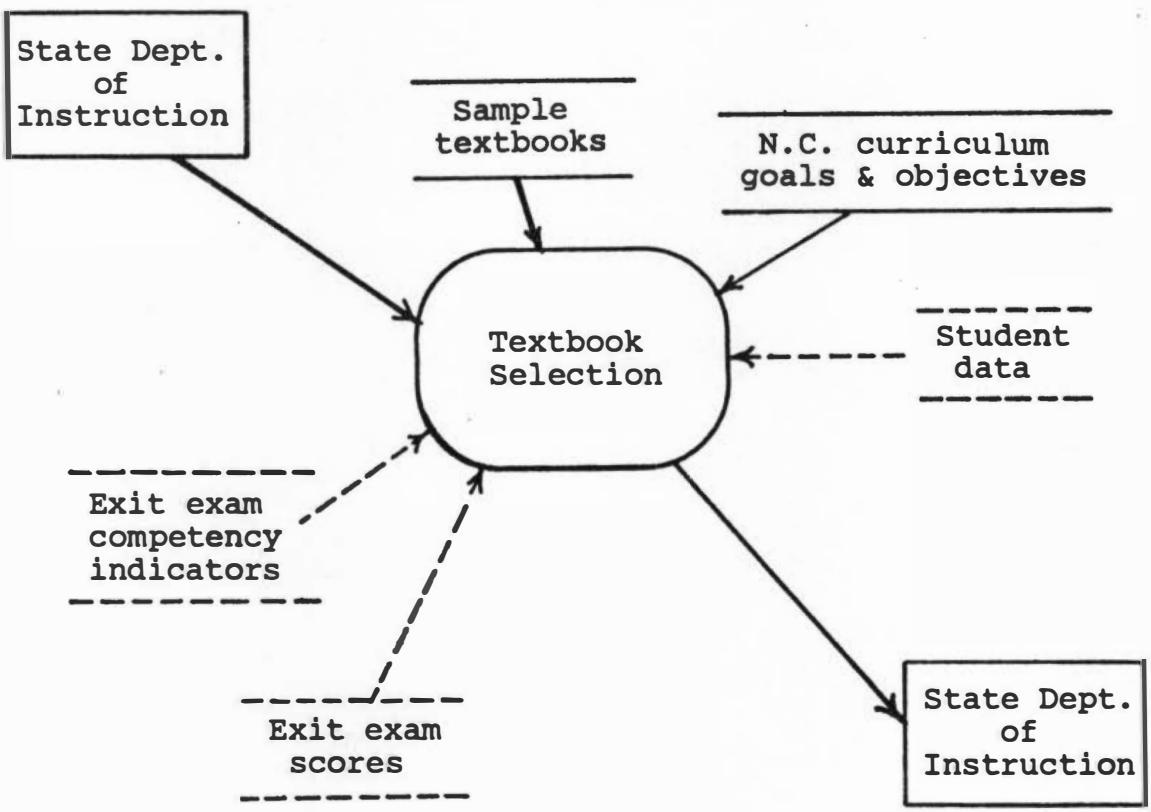


Figure 3. Context data flow diagram of the textbook selection process.

Department of Instruction publishes the North Carolina Annual Testing Program, Test Coordinator's Handbook which includes the goals and performance indicators for the math and reading competency tests administered to all North Carolina high school students. The California Achievement Test performance indicators are provided in materials sent to the school system when the tests are ordered. Student permanent records and computer printouts of examination scores represent the remaining new data files. The textbook selection process itself is shown as a rectangle with rounded corners and the flows of data into the process are shown as arrows. This diagram clarifies the basic outline of the information flows surrounding the textbook selection process.

Figure 4 shows the level two data flow diagram--this diagram models the internal mechanics of the textbook selection process as it has been developed in Cherokee County, including the new files requested by the county personnel. The initial request and final order are shown as heavy data flow arrows. Each rectangle with rounded corners represents an activity that accepts data inputs and produces new data outputs. Again, standard data files are shown with solid lines while the new files are shown with dotted lines.

The diagram illuminates the major tasks of the DSS designer. First, the needed information must be located and obtained. If possible, this information should be suitable

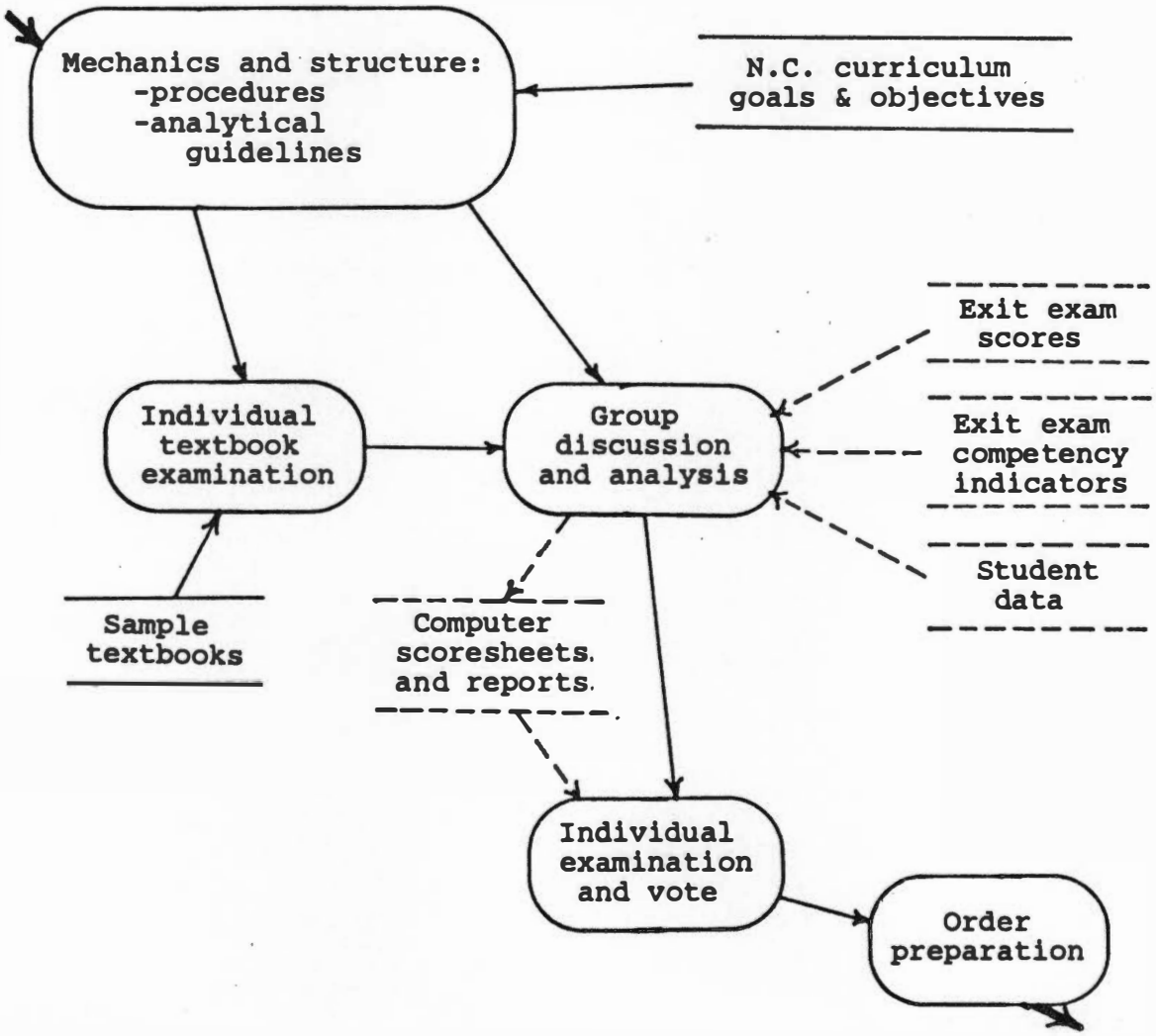


Figure 4. Data flow diagram of the details of the textbook selection process.

for operational and managerial control decision-making. Then this information has to be transformed into a format that can be entered into a computerized data base management system. Finally, methods of displaying the information upon demand, accepting new information as it is developed, and reporting the results have to be developed.

The Initial Decision Support System Templates

The information shown on the data flow diagrams was to be collected in a set of computerized guides called "templates." The extreme variability of the data requested by the teachers indicated that a pilot session should be held to refine the DSS templates and procedures rather than to select a specific textbook. The most useful methods had to be determined by using samples of the suggested DSS tools while discussing specific textbooks. A set of DSS templates was developed to test the templates and procedures themselves rather than to choose a textbook for a particular class and a meeting of the special education teachers was arranged to analyze reading textbooks.

Nine templates were constructed using the SuperCalc 3a program on an enhanced Apple IIe with an extended memory board. Each template, except the student achievement analysis, was constructed as a checklist.

Textbook Characteristics Analysis

The first template was developed from the textbook characteristics the teachers and administrators felt should be considered during the selection process. Figure 5 shows a portion of the "TEXTBOOK CHARACTERISTICS" template. (The complete series of templates is given in Appendix B.)

The "TEXTBOOK CHARACTERISTICS" template begins with a set of spaces allowing the entry of bibliographical data and then lists the series of textbook characteristics suggested by the teachers. After each item was a space for comments, a space for an evaluation score, S, which could range from 0 to 3, and a space for estimating the relative importance of the item, W, which also ranged from 0 to 3. The computer multiplied the evaluation score by the relative importance numeral to provide a weighted score for each item; these scores were then summed automatically to give a final total.

The computer screen was wide enough to show only one textbook evaluation at a time, by scrolling the computer cursor to the right, the first textbook evaluation was replaced by a new set of blanks for the second textbook, which in turn was replaced by blanks for texts three through five and thus all textbooks were evaluated on the same template.

Textbook Content Analysis

The construction of the templates to be used to analyze textbook content was much more difficult. A number of

TEXTBOOK EVALUATION PROGRAM: TEXTBOOK CHARACTERISTICS

TITLE _____
AUTHORS _____
PUBLISHER _____
GRADE LEVEL _____ PRICE _____
INSTRUCTIONAL PURPOSE _____

NO.	CHARACTERISTIC	EVALUATION	SCORE	WEIGHT	TOTAL
	Physical textbook qualities:				
A-1	Copyright date	_____	S	W	S*W
A-2	Binding quality	_____	S	W	S*W
A-3	Page layout	_____	S	W	S*W
	. . . . .				
	Supplemental materials available				
B-1	Teacher's guide	_____	S	W	S*W
B-2	Workbook	_____	S	W	S*W
	. . . . .				
	Content and Organization				
C-1	Readability	_____	S	W	S*W
C-2	Target group	_____	S	W	S*W
C-3	Background required	_____	S	W	S*W
	. . . . .				
	Special factors				
S-1	_____		S	W	S*W
	Total				000

Figure 5. Sample DSS template (printout from computer screen).

content analysis templates were developed to allow flexibility in stating the content that should be covered by the textbook. Three basic approaches to the statement of course content were used to develop separate templates:

1. The North Carolina Competency Goals and Performance Indicators statements of competency goals and performance indicators.
2. The skills sequence developed by the Brigance Basic Skills Inventory.
3. The competencies covered by the current exit exams used in North Carolina school systems.

Basic template format. The same template format was used for all content sources. Figure 6 illustrates the format used by showing a portion of the template which specified the North Carolina Competency Goals and Performance Indicators for reading in first through third grade classrooms. Within the subject of reading, skills were divided into broad domains, or "strands," and then further grouped in general skill categories labeled "competency goals." "Performance indicators" were then provided to clarify the aim of each goals. The numbers in the lefthand column designate the sequence of each goal and indicator within this schema. Although highly condensed, each goal statement and indicator description followed the grammatical construction of the original.

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE _____

3RD GRADE REGULAR CLASSROOM OBJECTIVES

NO.	STRAND	COMPETENCY GOAL AND PERFORMANCE INDICATORS	SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL [D*(E+F)]
		The learner will demonstrate				
	PRE-READING					
		omitted due to space and time limitations				
	VOCABULARY					
		omitted				
	PHONIC ANALYSIS					
11.x		Understanding and use of consonant letters and consonant clusters--initial & ending blends; digraphs; hard & soft g,c.				
12.x		Recognition of consonant digraphs				
13.x		Recognition of silent letters in words.				
14.x		Identification of long and short vowel sounds				
15.x		Application of vowel generalizations				
16.x		Use of word families				
	STRUCTURAL ANALYSIS					
17.x		Use of structural analysis in identifying words--compound words, root words, inflectional endings, plurals, possessives, syllables, and contractions.				
18.x		Use of contextual clues to understand words				

Figure 6. Sample content analysis template (printout from computer screen).

Item scoring. The four scoring columns followed a two stage evaluation process as suggested by several of the teachers. First, textbooks were screened to see if they cover or completely omit a particular indicator; if the text covered the skill, an evaluation of the quality of the instruction was placed in the next column. Then the amount of drill on the topic was scored from 1 to 3 as inadequate, adequate, or ample. The computer automatically provided sums and totals for each textbook in the final column.

North Carolina curriculum guide templates. Each set of the North Carolina Competency Goals and Performance Indicators covers a range of three or four years--there is one set for K-3, one for 4-6, one for 7-9, and one for 10-12. In order to illustrate the variety of ways the goals and indicators could be presented on a computerized template, four separate templates were constructed.

Content statement specificity. The more specific a template has to be, the more time it takes to construct and the more computer memory it requires. To determine how precise content statements needed to be, each of the four templates was developed to represent a different level of specificity. The "3RD GRADE REGULAR CLASSROOM OBJECTIVES" template--which covered the K-3 objectives for the phonic analysis strand--stated only the competency goal and did not

include performance indicators or examples. The "3RD GRADE SPECIAL EDUCATION OBJECTIVES" template--which covered the prereading skills strand--included performance indicators which detailed a rather restricted, concrete skill set. The "4TH GRADE NORMAL CLASSROOM OBJECTIVES" template--which covered word identification using structural analysis for the 4th-6th grade--included not only the general performance indicators, but also specific examples of each indicator. The "4TH-6TH GRADE SPECIAL EDUCATION OBJECTIVES" template--which covered reading comprehension skills for the 4th-6th grade--stated both the competency goals and the performance indicators but gave no specific examples of the performance indicators--indicators which were extremely vague because they tried to detail the broad skill area, comprehension over a three year grade span.

Other content analyses. To cover the content analyses using the two sources requested by the teachers, three additional templates were developed. The templates followed the same format as the first four but were derived from different sources. One covered a series of behavioral objectives taken from the Brigance Diagnostic Inventory of Basic Skills, Blue Level. Again, several different methods of stating the objectives and several different levels of statement specificity were covered so that teachers could react to the differences.

Next, a template was developed based on the skills tested by the California Achievement Test. The test score report was used to create a template that presented the main skill strands and general statements of objectives covered; more detailed test objectives were not available within the Cherokee County system.

Finally, a set of performance indicators for the North Carolina Competency Test was developed from the list of competency goals and indicators published as part of the North Carolina Competency Test Program, Test Coordinator's Handbook. The list is quite specific and the indicators are expressed as the general form of the questions and problems included on the exam.

Student Attribute Template

One template was developed to test the usefulness of examining specific student and class attributes. A template showing the reading achievement levels of a class of students, as measured by the California Achievement Test, was constructed. The student scores were written--without the student names--on a data entry form by a teacher's aide and then entered into the template. The scores were presented in both tabular and graphic formats. The class average and range was included.

Additional DSS Tools

Only one DSS tool was provided in addition to the nine templates: a textbook readability program was run on a second computer. The program reported on the readability of the textbook using seven different measures, including the Flesch Index, the Fog Index, the Dale-Chall Index, the Spache Scale, and the Fry Graph. A teacher aide typed several 100-200 word samples of a textbook and the computer computed the indices using the program's word lists and formulas.

Pilot Session with Special Education Teachers

The purpose of the pilot session with the group of ten special education teachers was to clarify the tools, procedures and data needs which were required to make a computerized DSS useful. The nine templates, the class reading achievement analysis, and the readability program covered the suggested analytical methods. The session was designed to evaluate the individual components of the textbook evaluation system rather than to evaluate specific textbooks.

Pilot Session Setup

One Apple IIe computer, attached to two monitors, was used to present each template and to record the teachers

evaluations. A second Apple IIe was available for readability analysis.

Two reading textbooks were chosen as samples: Reading Mastery III, a direct instruction text from SRA and Widening Circles, a conventional reading instruction text from Harcourt. The great differences between the textbooks helped judge the usefulness and flaws in each method of analysis.

Teachers were given copies of each template and were asked to write notes and reactions directly on the copies. The author followed a prepared session outline (see Appendix C) and took notes on special activities and responses.

Pilot Session Results

The most important result of the pilot session was the marked change in the attitude of the teachers toward analyzing textbooks in terms of curriculum objectives. Before, only two teachers had expressed such an interest; afterwards, all teachers felt that curriculum analysis would be helpful. In addition to determining which curriculum objectives are covered by particular texts, teachers suggested that a report detailing the objectives which were not covered, or were covered inadequately, would be useful.

Beyond the increased emphasis on content analysis using curriculum objectives, the data from this pilot session indicated three other results.

Objective statements. Teachers found the statements of North Carolina competency goals and performance indicators for general reading at the 10th-12th grades the most useful for two reasons. First, specific behavioral examples of the performance indicators were either obvious or clearly stated. Secondly, the same set of competency goals and performance indicators was used to construct the North Carolina Competency Test which serves as the exit exam for high school students.

Teachers used these two criteria in judging all the content templates--explicit objective statements with unambiguous referents and a high correlation between the curriculum objective statements and the exit exam content. Because the performance indicator statements were general enough to cover three grade levels, and because there was no precise correlation between the indicators and the exit exam content, teachers wanted to analyze textbook content in terms of several different templates--an impossibility within the constraints of a large group meeting of three hours.

Prior to this meeting, there was no analysis of the degree of correlation between the Brigance Diagnostic Inventory objectives, which most of the special education teachers used to develop their programs, the State Department mandated performance indicators, or the content of the

California Achievement Test. Because the sets of objectives were vague and sometimes conflicting, the previous experiences of the each teacher provided the concrete behavioral referents for each template item. The resulting disorder made the use of the DSS system difficult and time consuming.

System simplification. Another result was the need to simplify the system. Over three hours were needed to review the templates with minimal detailed analysis of the two textbooks. During the item-by-item discussion of the textbook characteristics template, teachers felt several items could be combined or dropped completely. Separation of the screening and the evaluation processes was also considered too complex--simply placing a score of "0" in the evaluation column indicated that an item was not covered in the text.

In presenting the items, a simple explanation plus a clear example was necessary so that all teachers shared the same conception of the item being considered. When this was done successfully, assigning an item importance weight was accomplished rather easily and was considered valuable.

The presentation of the student achievement data was interesting, but the relationship between the data and specific textbook attributes was too complex and unclear to warrant using the template.

Evaluation sensitivity. Of particular interest was the apparent lack of sensitivity of the templates to the teachers' instructional biases. Teachers seemed to maintain their prior preferences for either the traditional or the direct instructional approach regardless of the scores achieved on the templates. While no specific data were available under the design of the pilot session, two indicators appear notable. First, few items were directly related to the teacher's preference of instructional approach--only one item asked for an evaluation of the textbook approach and one for an evaluation of instructional methods. These two items showed somewhat more response variability than other items and even when judged of extra importance, they could not outweigh the large number of other items. Several teachers remarked that they were not certain how the evaluation would come out--but regardless of the actual ratings, they wanted reports of the content not adequately covered by the text.

Secondly, the computerized templates may score two textbooks the same when one covers all topics briefly while the other covers fewer topics in more detail. Again, teachers wanted the specific descriptive data showing what content was covered by each textbook, which textbook had the most adequate explanations and which textbook had the most exercises; the computer produced score was not as important

as the detailed data needed to make operational control decisions.

The Selection of a Computer Science Textbook

The results of the pilot session with the special education teachers were applied to the development of the templates and procedures used to select a textbook for a first year computer science/BASIC programming class at the high school level. Two templates, plus the readability analysis program, were developed and used to evaluate a set of four textbooks. The templates and procedures are discussed below--copies of the templates are in Appendix D and the work session procedures are in Appendix E.

Template Development

A simplified template of textbook characteristics was developed from the results of the pilot session with the special education teachers. Fifteen specific items were used instead of the original 26 and each item was assigned an initial weighting.

The content analysis was developed from an outline created by the coordinator of computer science programs, who simply used the table of contents of his favorite textbook as a guide. Each of the teachers involved accepted the outline and the template as a reasonable syllabus of the

intended course content. The rating system used the simplified procedure suggested during the first session.

Textbook Analysis

The readability of each textbook was analyzed by one of the teachers before the evaluation session. Three 100-200 word samples from each book, covering the same topics, were entered into the computer; the range of the reading indices, rather than a single score, was entered in the textbook characteristics template. Then the textbooks were rated on the other items on the templates.

Two of the items on the textbook characteristics template caused particular difficulty: first there was wide variation in evaluating the instructional methods and techniques included in each text. The teachers split evenly on the importance of instructional aids such as pretests and posttests, advanced organizers, chapter summaries and chapter review questions. Secondly, there was an even split on what general approach to the subject matter should be used by a good textbook--two teachers favored a rigorous, structured approach to programming and two preferred a less structured approach. These views represented a conflict within the field of computer science which could not be resolved easily.

The scoring on the content template was time-consuming but there was good general agreement on the evaluation of

both the quality of coverage of each topic and the amount of practice exercises provided for each topic. Table 4 lists the totals of each book on the characteristics and contents templates.

The table shows that the total scores were actually quite close. However, an examination of the templates reveals significant differences between the textbooks--for example, the Presley text was judged weak on the quality of presentation of many of the topics but strong on the student practice exercises, while the reverse was true of the Mandell and Mandell text. The Mandell text had the best combination of presentation quality and exercises on many

TABLE 4

COMPUTER SCIENCE TEXTBOOK SCORES

Textbook (Author)	Characteristics Score	Content Score
Presley	29	70
Mandell & Mandell	38	68
Bateson & Raygor	37	64
Mandell	39	60

topics, but completely omitted the topics on computer graphics. All of the textbooks omitted all the nonprogramming topics. Rather than use the quantitative results, lists were sorted and examined (on screen, because no printer was

available) by the teachers, each of whom evaluated the data in his own manner.

Again the lack of an agreed set of curriculum objectives hindered the use of the content evaluation template. Specifically, the teachers split on the importance of the historical and data processing topics and on the value of structured programming techniques and thus could not agree upon a specific textbook without a set of behavioral objectives defining the problem solving skills and programming structures to be demonstrated by students.

Summary of the Findings

The prototype DSS was built using a checklist format with fields for evaluative scores and comments--a simple data structure which was adequate for procedures requested. The field and dataset sizes were well within the limits of the SuperCalc 3a program on an Apple IIe with extended memory. Fields were less than 50 characters and total template sizes were less than 20K. This system provided only limited format and report capabilities, but a variety of sorts, scoring, and summary procedures were possible.

The specific costs of the system were minimal. All schools within the county already had the necessary computer hardware and either the SuperCalc 3a program or a reasonable

alternative. Some additional personnel costs were incurred. A single template could be produced in under an hour--the computer science template took 50 minutes--once the content statements were located and the layout learned, but several templates were used in each session. The evaluative sessions took longer than previous, noncomputer sessions because the computerized templates encouraged an increased depth and range of analysis.

The actual analyses which could be performed were limited by the quality of the available information. Teachers expressed a preference for goal and objective statements with explicit classroom referents; such statements were not currently available. Except for grade level, descriptions of student characteristics were also unavailable. The only source of detailed instructional information was the teacher's classroom experience. Even so, the teachers reported that reports generated on the specific characteristics of a textbook would be helpful not only for choosing a textbook, but also for use during instructional planning.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

Summary

The purpose of this study was to determine the feasibility of using a computerized decision support system (DSS) to aid school personnel in the selection of textbooks. The system was designed so that information about curriculum objectives, exit exam competencies, textbook attributes, and student characteristics could be managed by the computer; a committee could then apply this detailed analytical data to the textbook selection decision. The technical, economic, and operational feasibility of a prototype DSS was analyzed following an information management systems design cycle.

Textbook Selection

The study specifically focused on textbook selection as a crucial instructional decision which is difficult to make, due in part to information management problems. The determination of the best textbook to present an intended curriculum--while also adequately covering all the material to be tested on mandated exit examinations and fitting the competencies of incoming students--requires sifting through

a large amount of information. A computerized DSS could be an extremely valuable aid in the textbook selection process.

Research Design

To avoid disrupting the present selection processes, this study began the DSS design cycle by piloting a prototype system during the selection of text materials for special education and computer science classes. These classes were not directly subject to North Carolina state approved textbook lists and time constraints. The selection procedures used to choose regular classroom textbooks were simulated as closely as possible under circumstances allowing the introduction and analysis of the prototype computerized system.

Structured Interviews

Structured interviews of all participants were used to describe the textbook selection procedures and to determine the information that the participants would like to use on a computerized DSS. Data flow diagrams, developed from the information gathered during the interviews, were used to define the computerized data bases. Each database was constructed as a SuperCalc 3a template which could be presented and scored during a group analysis of the textbooks under consideration.

The individuals involved expressed divergent views on the information needed, and on the procedures and weighting to be used when analyzing textbooks. Additionally, there was no way of determining in advance the best data format and level of detail for the DSS data bases. Thus a pilot session was held with a group of special education teachers to refine the DSS templates and procedures.

Pilot Session with Special Education Teachers

This pilot showed that the prototype system data bases and analytical procedures had to be simplified so that the process was less time consuming. The curriculum and exit exam data bases needed to include more precise objective statements and, because the scoring system did not fully reflect teacher preferences, detailed reports for later instructional use were desirable.

Pilot Session with Computer Science Teachers

Using the results of the initial pilot, new data bases and analytical procedures were develped for use in the selection of a textbook for a high school computer science class. The information gained from this DSS prototype, along with the earlier interviews and pilot data, was used to determine the feasibility of the system.

Summary and Interpretation of Results

The data gathered from the interviews and both pilot sessions was applied to the questions of technical, economic, and operational feasibility of the DSS. This section summarizes the potentials and limitations of the system.

Technical Feasibility

Two factors determined the technical feasibility of the project--the size of the data elements and the total data set, and the amount of computational power needed to manage and report the data. The data element and set sizes were easily manageable by an Apple IIc, or an Apple IIe with an extended memory card. A checklist format with evaluation scores and comment fields provided an adequate information storage structure; sufficient memory was available to handle data sets many times larger than those used during the pilot sessions. While the report formatting capabilities were limited, lists of template items could be sorted and summaries generated according to specific criteria requested by the teachers.

Economic Feasibility

The costs directly ascribable to the DSS were affordable. Each school in the county had at least one computer capable of running the templates used in the pilot sessions. The needed software was also already available--the

templates could be created in the central office, paper copies distributed to the teachers, and then the program and templates brought from the office to the selection meetings.

Personnel costs were more difficult to ascertain. Producing a single template was reasonably easy and quick--less than an hour was needed. However, for a completely operational DSS, several different textbook analysis templates would have to be entered for each subject and grade level thus requiring up to 60 templates each year. Assuming that usable lists of class content were available, a considerable amount of time still would be necessary to prepare the computerized templates. At this point the available personnel time would be sufficient to develop many, but probably not all, of the templates needed for a year. A fully operational DSS would have to be built over a period of several years.

The pilot sessions were limited by the length of the school workday and hence were the same as the regular textbook selection meetings. However, unless some of the evaluation was done prior to the meetings, using a computer added to the evaluation time needed. First, providing a specific estimate of the quality of presentation and drill for each topic was more time consuming than the more cursory examinations normally performed at the meetings. Secondly, teachers wanted specific lists of the textbook evaluations and producing the lists took time.

The end result was that using the computerized DSS encouraged a more complete evaluation of the textbooks and hence required increased personnel costs. The willingness of the administrators and teachers to incur these costs would be directly dependent upon the perceived value of the information delivered to the participants.

Operational Feasibility

Three questions had to be addressed to determine the operational feasibility of the system: Would the teachers find particular data and reports useful? Were the characteristics and quality of the available information appropriate for use? And, was there sufficient value using the DSS to make further development feasible?

Producing usable data. Originally, the automatic scoring checklist format appeared to provide useful information in selecting a textbook. However, the teachers moved beyond that stage almost immediately. The final score differences were too small to provide useful information when choosing from among several high quality texts; adjusting the weights or refining the evaluations helped only slightly. Rather, teachers wanted several lists comparing specific textbook strengths and weaknesses. Which texts covered these topics well? Which texts provided sufficient drill on this subject? Which texts used this instructional approach? These

lists were then considered according to the unique evaluation processes of each teacher and a judgment made. The system was able to produce data deemed relevant to textbook selection, but additional emphasis needed to be placed on the quick production of reports on a high speed printer.

Data characteristics and quality. Two factors greatly simplified the analysis of the quality of data. First, teachers made no attempt to determine and apply "objective data" to the selection of textbooks; rather, the teachers explicitly tied their evaluations of all textbook characteristics and content to their personal instructional methods and to their knowledge of classroom situations. Secondly, broad summaries were found of little use--teachers wanted reports that retained the detailed data so that they could apply their own methods of aggregation and evaluation.

However, data currently available for use during textbook selection was not adequate for the analyses desired by the teachers. The available data fit the information characteristics profile of managerial control data rather than the profile of operational control data. The current statements of curriculum objectives and test competencies were not sufficiently detailed to guide the operational control decisions which had to be made by the teachers: the referents of the statements were too vague to support the precise

determination of student activities needed by the teachers. Student descriptive data, when available at all, was highly aggregated, of low accuracy, and at least one year old. Hence, the data characteristics limited the operational feasibility of the DSS.

Functional value. Teachers stated that only part of the value of using the DSS came from choosing more appropriate textbooks. The teachers perceived an additional value in the reports which could be printed from the content templates. These reports could be used to improve their instructional program by listing which topics were not covered, were inadequately covered, or which required supplemental learning activities when using a particular textbook.

During the initial interviews, several teachers commented that they could use either of two textbooks, even though the books were significantly different in content and approach. The teachers would adapt the books to their instructional style and needs. Most teachers noted that significant instructional adjustments had to be made from year to year because of differing class characteristics--the detailed reports produced during the selection process would be of significant value for instructional planning. Particularly during the time-consuming content evaluation, it was evident that the development of an acceptable DSS system

would require emphasis on both the selection of quality textbooks and the production of useful classroom content guides.

Discussion

The data flow diagram of the textbook selection process can be used to help demonstrate the problems of inappropriate information characteristics. Figure 7 highlights these problems. Operational control decisions require input statements of strategic objectives; each statement should be narrow enough in scope and with sufficient tangible referents to allow the derivation of highly detailed operational plans. The data flow diagram shows that the North Carolina Competency Goals and Performance Indicators, K-12 booklet represents the only explicit source of strategic information for the textbook selection process. The administrators studied placed great importance on these statements; the teachers initially found them interesting, then realized that much more detailed statements were needed.

Operational control decisions also need detailed accounts of the transactions which need to be managed--in selecting a textbook, many details of the instructional process are needed. The block of three data sets outlined on Figure 7 represents an attempt to provide instructional information relevant to textbook selection. Again, the data

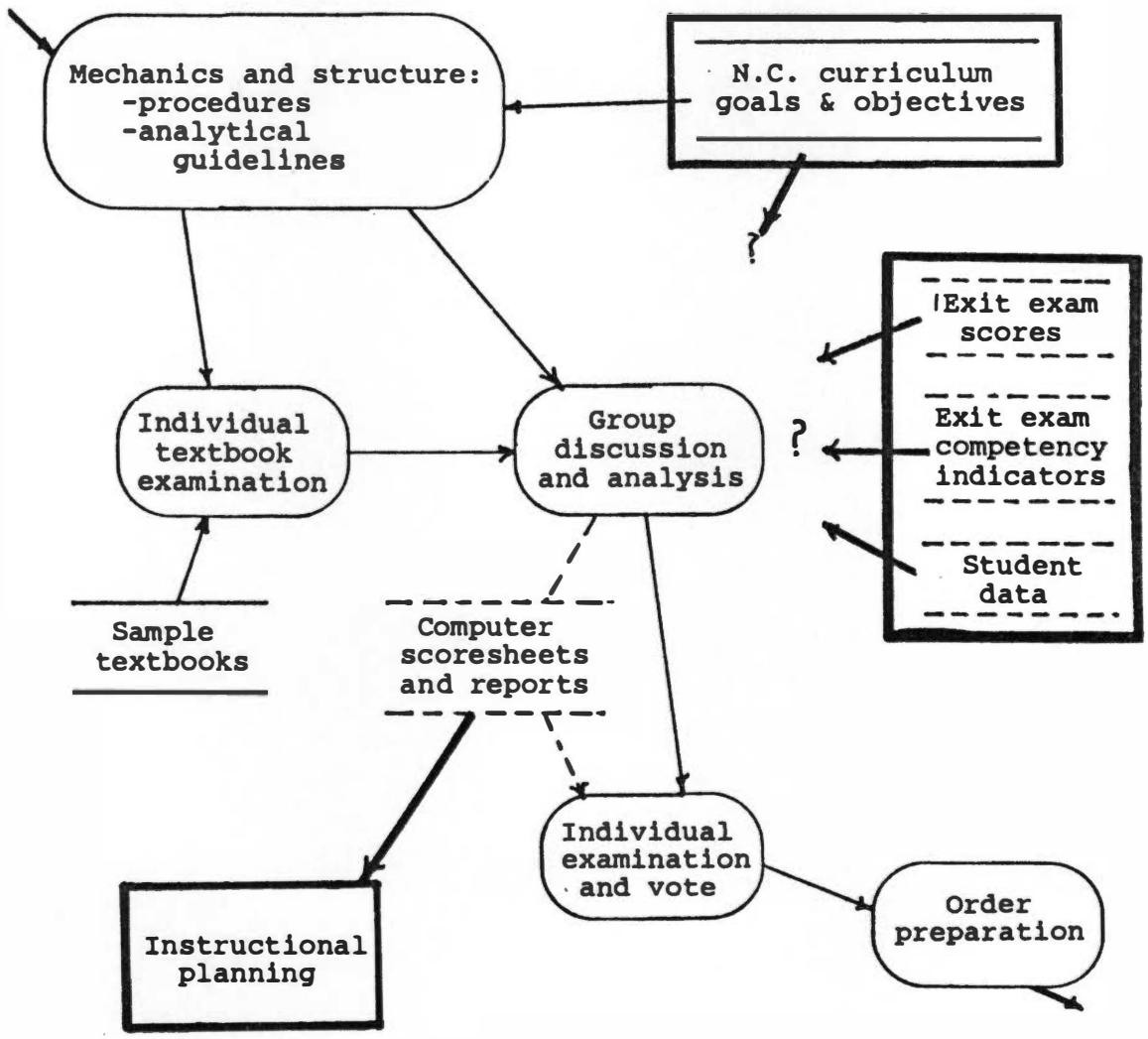


Figure 7. Data flow diagram demonstrating information characteristics problems.

is highly aggregated, low in accuracy, relatively old, and very wide in scope--just the opposite data characteristics of what is needed.

The exit exam competency indicators may be considered another source of strategic information. However, the statements easily available to teachers also lack the necessary information characteristics; the statements were designed simply to label student scores--hence they are included among the instructional information data sets.

Instructional planning has been added to the data flow diagram as a new terminator. If the textbook selection process gains true operational control inputs, the process produces information that is too valuable to be discarded after being condensed into a textbook order. Such an output also helps resolve the conflict between administrators--who may feel that all objectives should be covered by a textbook, and teachers--who may use the information generated during to selection process to determine how to supplement the textbook when some objectives are not covered.

Finally, using the prototype DSS revealed the weakness of the data flow diagram as a model: there was no systematic knowledge base relating curriculum objectives, student characteristics, and textbook characteristics with student achievement. Hence, the decision makers' selection process must have been based on their unique set of classroom

experiences rather than on a shared paradigm of textbook selection. Even where a knowledge base did exist--such as text organization for efficient instruction--the selectors apparently were not aware of the relevant knowledge or of how to apply it. The result was that the data flow diagram was incomplete as a model because it did not detail the actual procedures to be used to transform the information.

Implications and Recommendations for Further Study

Textbook analysis requires the management of a vast amount of information. This study suggests four areas that need to be examined in further studies of information management systems designed to handle textbook information: new statements of educational objections, the provision of additional information from the instructional process, the construction of more adequate textbook selection models, and more rigorous adherence to current systems design practices.

New Statements of Educational Objectives

One of the implications of this study was that more detailed statements of educational objectives were necessary. The North Carolina Department of Public Instruction is currently developing completely new statements of curriculum goals and objectives--statements which are to be specific enough to guide the development of subject and grade

level competency examinations. These statements are to be provided in machine readable format within two years. Once these statements are available, their inclusion in a DSS to help choose textbooks would represent a significant advance over the prototype used in this study. Operationally significant statements of managerial control decisions were the most significant lack observed during this study.

Additional Instructional Data

A second improvement would have been the availability of additional instructional information relevant to textbook selection. Some data, such as detailed analysis of current achievement test scores, might become available if textbook selection can be rescheduled for the summer months. Learner verification data showing how effective texts were in classroom pilot studies may also become available. EPIE (1983) reports that California and Florida have requirements that publishers provide "learner verification and revision" data demonstrating the effectiveness of textbooks before the books may be purchased and that Florida has been pressing publishers to comply. Such data, if it can be obtained, would have a significant impact by providing direct knowledge about student learning with specific materials; school personnel would not have had to make as many judgments based upon highly aggregated data.

Adequate Textbook Selection Models

The templates used in this study simply imitated the current textbook selection practices used by the individuals involved. Templates built around more adequate curriculum and instructional models would encourage a more rigorous and thorough analysis of the textbooks. Templates should be built on theoretical models that relate textbook content and instructional characteristics to student achievement, thus making it possible to systematically apply knowledge of classroom teaching to textbook selection. Considerable effort and experimentation would be necessary to build a DSS based on such models, but this should result in a more accurate analysis than possible when relying primarily upon the private knowledge of teachers.

Systems Design Practices

A variety of proven systems development practices have been detailed in the field of management information systems. In particular, the characteristics and quality of the information must match the operational level of the decisions to be analyzed. School personnel needed more detailed, accurate and current information; the current summary statements of goals and objectives were not sufficient. This information should be available in machine readable format at the time of textbook selection.

The emphasis on including the system users in the design of any computerized management information system was also underscored by this study. A systems designer building a textbook selection DSS could not predict the information, analyses, and reports necessary for the system be be useful without such input.

It should also have been possible to include additional sources of information. For example, textbook reviews from sources such as EPIE might have been added. A computerized DSS would have to allow for the addition of any relevant information and provide for the easy retrieval of that information during the analytical process.

Finally, this study demonstrated that computer usage is itself a developmental process. Participants learned as they worked with an information management system--they gained a new understanding of what was being done and saw new possibilities. Thus the DSS prototype design cycle will have to be completed many times before a computerized decision support system for textbook selection will become a normal part of the school environment.

LIST OF REFERENCES

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Amarez, M. & Chittenden, E. A. A conceptual study of knowledge use in schools. Paper presented at the Annual Meeting of the American Educational Research Association. New York: March, 1982.

Anthony, R. N. Planning and Control Systems: A Framework for Analysis. Cambridge, MA: Harvard University Graduate School of Business Administration, Studies in Management Control, 1965.

Armbruster, B. B., Osborn, J. H., & Davison, A. L. "Readability formulas may be dangerous to your textbooks." Educational Leadership, 1985, 42(7), 18-20.

Armbruster, B. B., Stevens, R. J., & Rosenshine, B. Analyzing content coverage and emphasis: A study of three curricula and two tests (Tech. Rep. No. 26). Urbana: Center for the Study of Reading. University of Illinois, 1977.

Awad, E. M. Introduction to computers in business. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1977.

Bailey, K. D. Methods of social research. New York: The Free Press, 1978.

Bateson, R. M., & Raygor, R. D. BASIC programming for the Apple computer. St. Paul: West Publishing Co., 1985.

Bennett, J. L. Analysis and design of the user interface for decision support systems, in J. L. Bennett (Ed.). Building decision support systems. Reading, MA: Addison-Wesley, 1983.

Bentley, T. J., & Forkner, I. H. Making information systems work for you: An MIS guide for business and professional people. Englewood Cliffs, NJ: Prentice-Hall, 1983.

Berliner, D. Executive function of teaching. Instructor, 1983, 93(9); 28-33.

Bloom, B. S. Human characteristics and school learning. New York: McGraw-Hill, 1976.

Bolster, A. S. Toward a more effective model of research on teaching. Harvard Educational Review, 1983, 53(3), 294-308.

Borko, H., & Cadwell, J. Individual differences in teachers' decision strategies: An investigation of classroom organization and management decisions. Journal of Educational Psychology, 1982, 74(4), 598-610.

Brigance, A. H. Brigance diagnostic inventory of basic skills. North Billerica, MA: Curriculum Associates, 1977.

Bristow, P. S., Pikulski, J. J., & Pelosi, P. L. A comparison of five estimates of reading instructional level. The Reading Teacher. 1983, 37(3), 273-279.

Brophy, J. E. How teachers influence what is taught and learned in classrooms. The Elementary School Journal. 1982, 83(1), 1-13.

Brunson, M. A. H. A comparative study of textbook readability and student comprehension levels in teacher education programs in elementary education. Unpublished doctoral dissertation, East Texas State University, 1980.

Buchanan, B. G., Barstow, D., Bechtal, R., Bennett, J., Clancey, W., Kulikowski, C., Mitchell, T., & Waterman, D. A. "Constructing an Expert System. In F. Hayes-Roth, D. A. Waterman, & D. B. Lenat (Eds.), Building expert systems. Reading, MA, Addison-Wesley, 1983.

Byers, J. L., & Evans, T. E. Using a lens-model analysis to identify rthe factors in teacher judgment (Research Series No. 73). East Lansing: Institute for Research on Teaching, Michigan State University, April, 1980.

Carlson, E. D. Developing the User Interface for Decision Support Systems. In J. L. Bennett (Ed.), Building decision support systems. Reading, MA: Addison-Wesley, 1983.

Chi, M. T. H., Glasser, R., & Rees, E. Expertise in problem-solving. In R. Sternberg (Ed.), Advances in the psychology of human intelligence. Hillsdale, NJ: Lawrence Erlbaum Associates, 1981.

Clark, C. M., & Yinger, R. J. Teachers' thinking. In P. L. Peterson & H. J. Walberg (Eds.), Research on teaching. Berkeley, CA: McCutchan, 1979.

Computers? You Bet I'm Interested! Instructor, 1982, 91(9), 76-77.

Davis, W. S. Tools and techniques for structured systems analysis and design. Reading, MA: Addison-Wesley, 1983.

Dolan, K. A. Business computer systems design. Santa Cruz, CA: Mitchell Publishing, 1984.

Doyle, W. Research on classroom contexts. Journal of Teacher Education, 1981, 32(6), 3-6.

Doyle, W. Academic work. Review of Educational Research, 1983, 53(2), 159-199.

Duffy, G. G. Fighting off the alligators: What research in real classrooms has to say about reading instruction. Journal of Reading Behavior, 1982, 14(4); 357-373.

Duffy, G., & Ball, D. Instructional decision making and reading teacher effectiveness (occasional paper no. 69). East Lansing: Institute for Research on Teaching, Michigan State University, August, 1983.

Early, M., Cooper, E. K., & Santeusanio, N. Widening circles. New York: Harchourt Brace Jovanovich, 1979.

Eckols, S. How to design and develop business systems. Fresno, CA: Mike Murach and Associates, 1983.

Edge, O. P., & Friedberg, S. Factors affecting achievement in the first course of calculus. Journal of Experimental Education, 1984, 52(3); 136-140.

Educational Products Information Exchange (EPIE). Research findings: NSAIM, two years later. EPIEGRAM (1976).

Educational Products Information Exchange (EPIE). National Institute of Education Study Final Report, NIE 6-79-0083, 1980.

Educational Products Information Exchange (EPIE). EPIElog of instructional materials assessment. EPIEGRAM (1983).

Engelmann, S., & Hanner, S. Reading mastery III. Chicago: Science Research Associates, 1983.

Farr, R., & Tulley, M. A. Do adoption committees perpetuate medicore textbooks. Phi Delta Kappan, 1985, 66(7); 467-471.

Field, M. H. Some effects of elementary science textbook readability levels on science achievement of elementary students with low, average, and high reading abilities. Unpublished doctoral dissertation. University of Tennessee, 1982.

Flemming, K. B. Assessment criteria for textbook selection as perceived by administrators, teachers, and lay persons in selected southern California unified school districts. Unpublished doctoral dissertation, University of Southern California, 1983.

Freeman, D. J., Kuhs, T. M., Porter, A. C., Knappen, L. B., Floden, R. E., Schmidt, W. H., & Schwille, J. R. Do textbooks and tests define a national curriculum in elementary school mathematics? Elementary School Journal, 1983, 83, 501-514.

Goldstein, P. Changing the American Schoolbook. Lexington, MA: D. C. Heath, 1978.

Good, T. Research on teaching. Paper presented at the American Educational Research Association, Boston, 1980.

Hunter, M. Teaching is Decision Making. Educational Leadership, 1979, 37(4), 62-68.

Hurst, E. G., Ness, D. N., Gambino, T. J., & Johnson, T. H. Growing DSS: A flexible, evolutionary approach. In J. L. Bennett (Ed), Building decision support systems. Reading, MA: Addison-Wesley, 1983.

Jorgensen, G. W. Student ability-material difficulty matching: Relationship to classroom behavior. Paper presented at the Annual meeting of the American Educational Research Association, Toronto, March, 1978.

Joyce, B. Toward a theory of information processing in teaching. Educational Research Quarterly, 1978-79, 3(4), 66-77.

Kech, R. J. The gathering and use of data about students as a factor in the curriculum decision of some secondary school teachers. Unpublished doctoral dissertation, Columbia University Teachers College, 1976.

Keen, P. G. W., & Gambino, T. J. Building a decision support system: The mythical man-month revisited. In J. L. Bennett (Ed.), Building decision support systems. Reading, MA: Addison-Wesley, 1983.

Keen, P. G. W., & Morton, M. S. S. Decision support systems: An organizational perspective. Reading, MA: Addison-Wesley, 1978.

Komoski, P. K. "Instructional materials will not improve until we change the system." Educational Leadership, 1985, 42(7),31-37.

Kroeber, D. W., & Watson, H. J. Computer-Based information systems: A management approach. New York: Macmillan, 1984.

Kunder, L. H. Procedures for textbook and instructional materials selection. Arlington, VA: Educational Research Service, Inc., 1976.

Lee, A. F. Why prototyping works. Infosystems, 1985, 32(3), 88-89.

MacGinitie, W. H. Difficulty with logical operations. The Reading Teacher. 1976, 29(4), 371-375.

Mandell, S. L. Complete BASIC programming. St. Paul: West Publishing Co., 1984.

Mandell, S. L., & Mandell, C. J. Understanding BASIC. St. Paul: West Publishing Co., 1985.

Martin, J. An End-user's guide to data base. Englewood Cliffs, NJ: Prentice-Hall, 1981.

Marx, R. W. Teacher Judgments of Students' Cognitive and Affective Outcomes. Unpublished doctoral dissertation, Stanford University, 1978.

McConkie, G. W. Learning for Text. In L. S. Shulman (Ed.), Review of research in education. Itasca, IL: F. E. Peacock, 1977.

McCutcheon, G. Curriculum theory/curriculum practice: A gap or the grand cannyon? In A. Molnar (Ed.), Current thought on curriculum, the 1985 ASCD yearbook. Alexandria, VA: The Association for Supervision and Curriculum Development, 1985.

Montello, P. A., & Wimberly, C. A. Management Systems in Education. Lincoln, NE: Professional Educators Publicatiions, 1975.

Morine-Dershimer, G. Planning in classroom reality, an in-depth look. Educational Research Quarterly, 1978-79, 3(4), 83-99.

Muther, C. How to evaluate a basal textbook: The skills trace. Educational Leadership, 42(4), 79-80.

North Carolina Department of Public Instruction, Division of Textbooks. North Carolina State adopted basic textbooks, 1984-1985. Raleigh, NC, 1984.

North Carolina Department of Public Instruction, Division of Research. North Carolina annual testing program, test coordinator's handbook, 1984-1985. Raleigh, NC, 1984.

orth Carolina Department of Public Instruction, Division of Instructional Services. North Carolina competency goals and performance indicators, K-12. Raleigh, NC, 1984.

North Carolina Department of Public Instruction, Division of Instructional Services. North Carolina competency goals and performance indicators, K-12: Educable mentally handicapped learners supplement. Raleigh, NC, 1984.

Presley, B. A guide to programming in Applesoft. Albany, NY: Delmar Publishers, 1984

Raser, J. R. Simulation and society: An exploration of scientific gaming. Boston: Allyn and Bacon, 1969.

Resnick, L. B., & Ford, W. W. The Psychology of mathematics for Instruction. Hillsdale, NJ: Kawrence Erlbaum Assoc., 1981.

Rogers, V. Qualitative research: Another way of knowing. In P. L. Hosford (Ed.), Using what we know about teaching, the 1984 ASCD yearbook. Alexandria, VA: The Association for Supervision and Curriculum Development, 1984.

Shavelson, R. J., & Stern, P. Research on Teachers' Pedagogical Thoughts, Judgments, Decisions, and Behavior. Review of Educational Research, 1981, 51(4), 455-498.

Shoreman, D. J. The effects of readability, study guides and listening-reading on the comprehension of sixth grade social studies textbook materials. Unpublished doctoral dissertation, Boston University, 1982.

Simon, H. A. The new science of management decision. New York: Harper and Row, 1960.

Sorcim/IUS. SuperCalc 3a. San Jose, CA: Sorcim/IUS Micro Software, 1985.

Spache, G. D. Good reading for poor readers. Champaign, IL: Gerrard, 1978.

Sprague, C. W. Textbook readability: Measurements by objective formulas compared to judgements of experienced teachers. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill, 1968.

Stabell, C. B. "A decision-oriented approach to building DSS." In J. L. Bennett (Ed.), Building decision support systems. Reading, MA: Addison-Wesley, 1983.

Yinger, R. J. A study of teacher planning: Description and theory development using ethnographic and information processing methods. Unpublished doctoral dissertation, Michigan State University, 1977.

Zecchini, S. A study of the predictive value of the Diagnostic Reading Scales and the Woodcock Reading Mastery Tests for instructional level basal placement. Unpublished doctoral dissertation, University of Tennessee, 1983.

APPENDICES

APPENDIX A

SCRIPT USED FOR ALL INTERVIEWS

TEXT MATERIALS SELECTION DATABASE

TEACHERS DISCUSSION GUIDE

Teacher:_____ Class:_____

Notes:_____

The recent emphasis on achievement and competency testing requires effective instruction. Teachers must be certain each student learns as much of the course content as possible. This demands high quality text materials.

Choosing text materials for a class requires comparing a number of materials to see which best fits your needs. It may be possible to use a computer to help manage the information about your program, students and text materials so that you can make more effective decisions.

_____

_____

_____

If you have a particular evaluation form that you already use, we may be able to use that form directly.

_____

If you would prefer to build an evaluation that is tailored to your needs, consider the following five factors:

1. The curriculum objectives or content topics you wish to cover.
2. The tests the students will take at the end of the year.
3. The reading difficulty of the materials compared with the students' reading achievement.
4. The background knowledge and reasoning abilities students need to understand the materials.
5. The support the materials provide for your instructional methods and activities.

_____

I. If you want to compare how well each text material covers the curriculum, you may want to have entered into the computer:

A. A list of the state or local course objectives.

_____

_____

B. Your own list of the course topics you want to cover in class.

_____

_____

C. A set of sample objectives from your own IEPs that cover the content you teach.

_____

_____

II. If you want to check to see if the text materials cover the competencies which will be included on the end of the year achievement or competency tests you may want to have entered into the computer:

A. A list of the competencies covered on the California Achievement Test.
B. A list of the competencies covered on the North Carolina Competency Test.
C. A list of the competencies covered on a specific test you use:
Test Name:_____
D. A list of the competencies you cover on your own tests.

_____

_____

III. If you want to match the text readability with the students' reading achievement level, you may want the computer to help by:

A. Using a computer program to compute the text readability levels, and by

B. having the reading achievement test scores for the students who might be in your class entered into the computer. The data should be presented:
--> As columns of individual scores.
--> Statistically with the average, mode(s), and standard deviation.
--> As a graph of the scores.

_____

IV. If you want to analyze the students' background, you might want to have included in the computer database information about:

A. The students' socioeconomic background.
B. The students' previous courses and grades.
C. The students' previous achievement test scores in subjects other than reading.
D. Other student data:

-->_____

V. If you have items that are particularly important to your instructional needs, you might include:

A. Textbook characteristics: Copyright date, binding, layout and illustrations quality.

_____

B. Supplemental materials: Teacher's guide, workbook, mimeograph papers, filmstrips, records, tapes, computer programs, etc.

_____

C. Content and organization evaluation.

_____

D. An indicator of motivational factors.

_____

E. Instructional factors such as use of advance organizers, chapter summaries, review questions, and aids to student comprehension.

_____

F. Support for the special instructional activities you use in your classes.

_____

G. Other special factors:

_____

There are a variety of ways to indicate how well a textbook satisfies each of the requirements you have specified.

1. Pass/fail or Yes/No.
2. Excellent/good/fair/poor.
3. Strict Numeric scale: 1 to 3, or 1 to 5, or 1 to 10.
4. Percentage scale: eg. meets 80% of my needs.
5. Combination label/numeric scale: 0 = omitted, 1 = below average, 2 = average, 3 = above average, 4 = superior.

_____

_____

Additional comments: _____

_____

APPENDIX B

TEMPLATE COMPUTER SCREENS* USED WITH SPECIAL EDUCATION TEACHERS FOR ANALYSIS OF TEXTBOOKS

*The following pages are printouts from the computer screen as viewed by the teachers for making their analyses.

TEXTBOOK EVALUATION PROGRAM: TEXTBOOK CHARACTERISTICS

TITLE _____
AUTHORS _____
PUBLISHERS _____
GRADE LEVEL _____ PRICE _____
INSTRUCTIONAL PURPOSE: _____
_____
_____

NO.	CHARACTERISTIC	EVALUATION	SCORE	WEIGHT	TOTAL
	Physical textbook qualities:				
A-1	The copyright date is	_____		1	0
A-2	Binding quality is	_____		1	0
A-3	The page layout is	_____		2	0
A-4	The print legibility	_____		1	0
A-5	Color illustrations	_____		1	0
A-6	Illustration quality	_____		2	0
A-7	Publisher	_____		1	0
	Supplemental materials available				
B-1	Teacher's guide	_____		1	0
B-2	Workbook	_____		1	0
B-3	Mimeograph masters	_____		1	0
B-4	Audio tapes	_____		1	0
B-5	Computer programs	_____		1	0
B-6	Other special materials	_____		1	0
	Content and Organization				
C-1	Readability	_____		1	0
C-2	Target group	_____		1	0
C-3	Background required	_____		1	0
C-4	Student interest level	_____		2	0
C-5	Content diversity	_____		1	0
C-6	Success potential	_____		2	0
C-7	Content organization	_____		1	0
C-8	Approach to subject	_____		1	0
C-9	Presentation level	_____		1	0
C-10	Explanation quality	_____		1	0
C-11	Amount drill & practice	_____		2	0
C-12	Enrichment activities	_____		1	0
C-13	Instructional methods	_____		2	0
	Special factors				
S-1	_____			1	0
S-2	_____			1	0
	TOTALS				0

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE _____

3RD GRADE REGULAR CLASSROOM OBJECTIVES

NO.	STRAND	COMPETENCY GOAL AND PERFORMANCE INDICATORS	SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL [D*(E+F)]
		The learner will demonstrate				
	PRE-READING	omitted due to space and time limitations				
	VOCABULARY	omitted				
	PHONIC ANALYSIS					
11.x		Understanding and use of consonant letters and consonant clusters--initial & ending blends; digraphs; hard & soft g,c.				
12.x		Recognition of consonant digraphs				
13.x		Recognition of silent letters in words.				
14.x		Identification of long and short vowel sounds				
15.x		Application of vowel generalizations				
16.x		Use of word families				
	STRUCTURAL ANALYSIS					
17.x		Use of structural analysis in identifying words--compound words, root words, inflectional endings, plurals, possessives, syllables, and contractions.				
18.x		Use of contextual clues to understand words				

		SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL [D*(E+F)]
	LITERAL COMPREHENSION				
19.x	Recall of events in sequence				
20.x	Ability to follow simple directions				
21.x	Ability to classify--where, when, why, or by category--animals, objects, feelings, etc				
22.x	Recognition of main idea and details				
23.x	Understanding of the setting of a story				
	INTERPRETIVE COMPREHENSION				
24.x	Ability to identify cause and effect relationships.				
25.x	Ability to identify inferred ideas--make inferences from information given or predict future action.				
26.x	Ability to identify the implied main idea.				
27.x	Ability to employ character analysis				
28.x	Ability to discover relationships--respond to concept word with related words.				
29.x	Ability to draw conclusions--including verification by summarizing supporting information.				
	CRITICAL COMPREHENSION				
	omitted				

STUDY SKILLS		SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL [D*(E+F)]
33.x	Ability to alphabetizing words--by initial, first two, and first three letters.				
34.x	Ability to use book parts--table of contents glossary, title page and index.				
35.x	Ability to use dictionary skills--use guide words, determine appropriate meaning				
36.x	Ability to use resources--TV schedule, telephone directory.				
37.x	Ability to interpret pictorial materials--map locations & legends, graphs, charts, calendar, and globe.				
38.x	Ability to use the media center--locate and check-out appropriate materials.				
APPRECIATION OF LITERATURE omitted					
TOTALS					

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE _____

3RD GRADE SPECIAL EDUCATION OBJECTIVES

NO.	"STRAND"	COMPETENCY GOAL AND PERFORMANCE INDICATORS The learner will demonstrate	SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL SCORE [D*(E+F)]
	PRE-READING					
1.x		Oral expression commensurate with his/her mental ability				
2.x		Adequacy of visual discrimination & memory				
3.x		Adequacy of auditory discrimination & memory				
4.x		Adequate comprehension skills				
4.1		describe objects				
4.2		answer questions about a story				
4.3		Identify significant details in a story				
4.4		recall story in sequency				
4.5		identify descriptive words				
4.6		Identify phrase and sentence meaning				
4.7		demonstrate use of punctuation as a guide to meaning				
4.8		distinguish speaker and character addressed				
4.9		identify words of speaker				
4.10		identify words of speaker				
4.11		identify text with related illustrations				
4.12		identify main idea of a paragraph				
4.13		identify facts				
4.14		distinguish between true and false statements				

5.x	Use of word attack skills	
5.1	use of initial consonants	
5.2	distinguish rhyming words from non-rhyming words	
5.3	distinguish configuration clues by matching	
5.4	substitute initial consonants	
5.5	identify "s" suffix ending	
5.6	identify "who" as a question word	
5.7	use of final consonants in words	
5.8	recognize given words in context	
5.9	substitute final consonants	
5.10	spell words from Dolch list of nouns	
5.11	spell words in Dolch list of Basic sight words	
5.12	identify possessives	
5.13	identify phonetic elements in rhyming words	
5.14	identify contractions	
5.15	identify and build compound words	
5.16	name vowels	
6.x	Visual-motor skills commensurate with his/her mental ability	
7.x	An adequate vocabulary	
7.1	understand meaning of words identifying objects in immediate environment, i.e. house, street, school, food, toys, etc.	
7.2	understand meaning of basic words used by primary children such as in, out, up, down, open, close, etc.	
7.3	understand ideas through listening by answering questions	
7.4	show interest in words and symbols as measured by teacher judgement	
TOTAL BOOK COVERAGE OF STATE OBJECTIVES:		0 0

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE _____

4th GRADE NORMAL CLASSROOM OBJECTIVES

NO.	COMPETENCY GOAL AND PERFORMANCE INDICATORS The learner will demonstrate	SCREENING (yes=1/no=0)	QUALITY (1 to 3)	DRILL (1 to 3)	SCORE [C*(D+E)]
44.x	The use of structural analysis in identifying words:				
44.1	Identify words using prefixes: Ex: dis-not ; re-again ; un-not non-not ; ex-out ; pre-before bi-two ; anti-against; uni-one				
44.2	Identify words using suffixes: Ex: able - capable of being ant/ent - state of, person who ive - like or pertaining to ation,tion,ion - process or action ance - state of ment - action or process				
44.3	Identify words using Greek and Latin roots Ex: graph, gram - write circum - circle fac - make voc - voice grand - great hydr - water homo - same chron - time				

44.5 Identify comparative & superlative forms in sentences.
Ex: The grass is _____ than yesterday
wet, wetter, wettest
Jim was the _____ of all the boys.
more handsome, most handsome

45.x The use of contextual clues in identifying unknown words.

45.1 Rely on experiences.
Ex: the restaurant tables were covered with red & white checked tablecloths and the menu listed Italian food. John ate _____ that night.

45.2 use the definition of the word within context:
Ex: His TENACIOUS attitude kept Billy from quitting.

45.3 Use contrast and comparison to complete the thought in a sentence:
Ex: That door is ____ but this one is locked.

45.4 Use the meaning of a familiar cliche to identify unknown words.
Ex: Even though I was angry, my mother said that I should hold my TONGUE.

45.5 Use synonyms to identify unknown words.
Ex: The man was a vagabond, or wanderer, and he had no real home.

==========

TOTAL SCORE

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE_____

4TH-6TH GRADE SPECIAL EDUCATION OBJECTIVES

NO.	COMPETENCY GOAL AND PERFORMANCE INDICATORS The learner will demonstrate	SCREENING (yes=1/no=0)	QUALITY (1 to 3)	DRILL (1 to 3)	SCORE [C*(D+E)]
1.X	comprehension skills commensurate with his/her mental ability				
1.1	organize main ideas in sequence				
1.2	verify answers through reading				
1.3	distinguish between fact and fancy				
1.4	perceive simple cause and effect				
1.5	interpret author's point of view				
1.6	construct an ending based on a given story fragment				
1.7	orally respond to comprehension questions is simple sentences				
1.8	order facts or events in logical sequence using a story the pupil has read				
1.9	recognize conversation in a story				
1.10	summarize a paragraph				
1.11	identify main ideas in own words				
1.12	state main ideas in own words				
1.13	predict possible outcomes				
1.14	identify supporting details and state in own words				
1.15	draw conclusions based on evidence				
1.16	recall specific facts by answering comprehension questions about a movie				
1.17	interpret the mood of a story and a picture				
1.18	make simple generalizations from information given in a story				

1.19 verify a prediction of outcomes based on specific contentj
1.20 read critically to identify cause and effect relationships

2.x word attack skills in identifying words
2.1 initial blends BR, FR, GR, TR, CR, ...
2.2 form contractions
2.3 spell words on Dolch List of Nouns
2.4 spell words on Dolch Basic Sight Words
2.5 hear syllables
2.6 apply rule that Y at beginning of word is generally a consonant; at end of a word it is usually a vowel
2.7 identify & discriminate long vowel sounds
2.8 hear syllsables
2.9 identify the sound of common phonetic letter group elements: AD, AME, AR, EN IGHT, ND, OLD, OOK, and ER
2.10 substitute initial blends BR, FR, GR,....
2.11 identify & discrinimate short vowel sounds
2.12 apply the rule that when a word has only one vowel the vowel is usually short
2.13 identify the sounds of OO as in foot
2.14 discriminate and mark long and short vowels properly
2.15 apply the rule that when there are two vowels, one of which is a final E, the first is long and the E is silent
2.16 identify the suffix ER as an agent, such as farm--farmer.
2.17 identify and use the prefix UN
2.18 identify consonant blends ST,SC,SP,SK,...
2.19 identify one, two & three syllable words
2.20 identify root words

3.x The skill of alphabetizing
3.1 alphabetize to second letter
3.2 identify words according to category
3.3 alphabetize to third letter

4.x The application of dictionary skills
- 4.1 use the dictionary to locate words
- 4.2 use guide words to help locate words
- 4.3 locate one definition of a word
- 4.4 locate two definitions of a word
- 4.5 divide word into syllables with the use of a dictionary

5.x The skills of locating and interpreting information using book parts
- 5.1 Locate information using chapter, author, table of contents, and pages included in a story
- 5.2 identify use of parts of a book: table of contents, preface, index, title page, main part, glossary
- 5.3 demonstrate use of the telephone book

6.x Vocabulary skills
- 6.1 develop oral vocabulary sufficiently to convey ideas as measured by teacher judgment
- 6.2 recognize, pronounce and understand high frequency words of sight such as the Dolch 220 word list
- 6.3 recognize and read orally survival words
- 6.4 recognize signal words such as: WHO, WHAT, WHERE, HOWEVER, BECAUSE,....
- 6.5 understand multiple meanings of words by using the appropriate word in context
- 6.6 understand and use synonyms
- 6.7 understand and use antonyms
- 6.8 understand and use homonyms
- 6.9 understand and use homographs (words having the same spelling but different meanings) by writing sentences

==========

TOTALS

TEXTBOOK EVALUATION PROGRAM: BRIGANCE BASIC SKILLS INVENTORY

TITLE _____

KEYED BY TOPIC TO BRIGANCE DIAGNOSTIC (BLUE) INVENTORY

NO.	TOPIC	COMPETENCY GOAL AND PERFORMANCE INDICATORS The learner will demonstrate	SCREENING (yes=1/no=0)	QUALITY (1 TO 3)	DRILL (1 TO 3)	TOTAL SCORE [D*(E+F)]
		Command of a basic sight vocabulary				
A-2		basic 250 words				
A-3		37 direction words				
A-4		57 abbreviations				
A-5		32 contractions				
A-6		40 common signs				
		Word analysis skills				
C-3		visual recognition of initial consonants or When presented with a list of 20 consonants listed in the order commonly taught, student will indicate the sound of __ in the initial position				
C-4		substitution of initial consonant sound or When presented with two rhyming words with different initial consonants, having the first word pronounced, the student will pronounce the second by substituting the initial consonant				
C-5		auditory recognition of ending sounds				
C-6		names of vowels				
C-7		short vowel sounds/single vowel rule				
C-8		long vowel sounds/final e/double vowel rules				
C-9		recognizes initial clusters auditorily				
C-10		recognizes initial clusters visually				
C-11		substitutes initial cluster sounds				

C-12 digraphs and dipthongs
C-13 phonetic irregularities
C-14 common endings of rhyming words
C-15 suffixes
C-16 prefixes
C-17 meaning of prefixes
C-18 number of syllables auditorily
C-19 syllabication concepts and rules

Vocabulary development
D-1 Use of context
D-2 classification
D-3 analogies
D-4 antonyms
D-5 homonyms

Writing skills
A-1 writing lower case cursive letters
A-2 writing upper case cursive letters
A-3 writing personal data

Mechanics of grammar
B-1 Capitalization
1--beginning of sentence,names of people
2--days of the wee
3--months, special days, streets, cities, titles
4--special groups
5--special groups

B-2 Punctuation
1--period after sentence & abbreviation
2--question mark & comma in date & address
2--apostrophe
3--quotation marks
4--exclamation point

B-3 Parts of speech
3--noun & pronoun
4--verb, adjective, adverb, conjunction,
4--preposition
5--interjection

Reference skills

D-1 Alphabetical order
- 1--letters
- 2--consecutive first letters;
- 2--not consecutive first letters
- 3--same first letter, same first two letters
- 4--same first 3 letters, same first 4 letters
- 5--same first 5 letters

D-2 Dictionary use
- 3--recognizes, locates guide words
- 3--uses guide words, syllabicates, accent marks
- 4--uses pronunciation key
- 5--finds synonyms, finds antonym,
- 6--determines parts of speech

D-3 Reference book-index
D-4 Reference skills-encyclopedia
D-5 Parts of a book--location
D-6 Parts of a book--purpose
D-7 Outlining
D-8 Graphs
D-9 Maps

TEXTBOOK EVALUATION PROGRAM: NC STATE READING OBJECTIVES

TITLE_____

HIGH SCHOOL COMPETENCY TEST READING OBJECTIVES

NO.	COMPETENCY GOAL AND PERFORMANCE INDICATORS THE LEARNER WILL	SCREENING (yes=1/no=0)	QUALITY (1 to 3)	DRILL (1 to 3)	SCORE [D*(E+F)]
1.X	Demonstrate word knowledge and use contextual clues and abbrevciations to determine meaning				
1.1	use contextual clues and abbreviations to understand a classified ad.				
1.2	use contextual clues and abbreviations to understand a newspaper or magazine article, telephone directory, and/or various application forms				
2.x	Read and follow written directions accurately				
2.1	identify the proper placement of data on an auto loan application/similar form. .				
2.2	match information to correct numbered space on form calling for personal statistics. .				
2.3	identify required data and placement on unemployment insurance form				
2.4	determine the correct placement of specific information on numbered blank spaces on an employment application, change of address form, or appartment rental application or similar form				
2.5	follow directions in filling out a social security application or similar form. . .				
2.6	will be able to correctly follow the directions for a "do it yourself" project.				

2.7 will be able to sequence "do it yourself" directions properly

2.8 will understand given directions on labels (insect spray poison, medicine bottles danger signals, etc.) and answer specific questions . . . . . .

3.x Select main idea and related detail

3.1 from a sample driver's license test. . . .

3.2 from magazine or newspaper articles. . . .

3.3 from from classified ads. . . . . .

3.4 from various kinds of warranties. . . . .

3.5 from a business or personal letter. . . .

4.x Read and classify information

4.1 classify information in order to determine the information required for proper completion of various application forms (library card, employment application, charge account agreement, etc. . . . .

4.2 demonstrate use of classification of information on a dictionary page, such as parts of speech, choosing the appropriate definition for a word, etc.

4.3 use map reading skills to identify various numbered highways, interstate highways cities, etc. . . . . .

5.x Read and draw inferences from various reading materials

5.1 make inferences from concise abbreviated information in classified ads. . . . .

5.2 will draw inferences about various programs time, and stations, etc. in a TV guide

5.3 respond appropriately to a series of road signs . . . . . .

5.4 make appropriate inferences from various magazine and newspaper articles, warranties, utility bills, etc. . . . . .

5.5 demonstrate the ability to use an index such as a telephone directory, repair manuals, catalogues, etc. . . . . .

6.x Read and draw conclusions

6.1 read and draw conclusions to answer specific questions about newspaper and magazine articles . . . . . .

6.2 draw conclusions on locations, directions distances, etc. in answering specific questions about various kinds of maps and charts. . . . . .

ABBREVIATED OBJECTIVE FORMAT

7.x compare and contrast various reading materials TV guide, maps, map with time zones. . .

8.x Organize information using various types of materials unemployment insurance claim, charge accounts, appartment rental application, pages index, telephone directory, map or similar material. . . . . .

9.x Locate and apply information TV guide, service schedule, index or directory, maps, telephone directory utility bill or other statement. . . .

10.x Interpret maps, legends, charts, & pictures highway, street, area code, and time zone maps; highway signs; postal rate population, and weather charts . . . . .

TOTAL SCORES: . . . . . .

TEXTBOOK EVALUATION PROGRAM: NC STATE TESTING OBJECTIVES

TITLE _____

THIRD & SIXTH GRADE C.A.T. REPORT FORMATS

NO.	TOPIC	TEST COMPETENCY AND PERFORMANCE INDICATORS The learner will demonstrate	SCREENING (yes=1/no=0)	QUALITY (1 to 3)	DRILL (1 to 3)	SCORE [D*(E+F)]
R.1	Skill in phonic analysis					
		consonant clusters/digraphs.				
		short, long vowels & combinations				
		diphthongs.				
		variant vowells & combinations				
R.2	Skill in structural analysis					
		Compound words/syllables contractions. . .				
		Base words/affixes				
R.3	Adequate vocabulary skills					
		words of same meaning				
		words of opposite meaning				
		words with multi-meaning				
R.4	Reading comprehension skills					
		recall of facts				
		inferred meaning				
		character analysis				
		figurative language				
		real/unreal elements				
SL.1	Spelling skills					
		consonant phonemes/grapheme				
		vowell phonemes/grapheme				
		morphemic units				
SL.2	Language mechanics					
		I/proper nouns				
		beginning words/titles				
		endmarks				
		comma				

SL.3 Language expression

pronouns. . . . . .
verbs . . . . . .
adjectives . . . . . .
subjects/verbs . . . . . .
modifying words . . . . . .

THIRD GRADE TOTAL SCORES

R.1 Reading vocabulary

Words of the same maning . . . . . .
words of opposite meaning . . . . . .
words with multiple meanings . . . . . .

R.2 Reading comprehension

recall of facts . . . . . .
inferred meaning . . . . . .
character analysis . . . . . .
figurative language . . . . . .
author attitude/position . . . . . .
techniques of persuasion . . . . . .

SL.1 Spelling

consonant phonemes/graphemes . . . . . .
vowel phonemes/graphemes . . . . . .
morpheme units . . . . . .

SL.2 Language mechanics

I/proper nouns/adjectives . . . . . .
beginning words/titles . . . . . .
end marks . . . . . .
comma . . . . . .
quotation marks . . . . . .

SL.3 Language expression

pronouns . . . . . .
verbs . . . . . .
adjectives . . . . . .
subject/verb . . . . . .
modify/transitional words . . . . . .
complete/incomplete/run-on . . . . . .
sequence/topic sentence . . . . . .

SIXTH GRADE TOTAL SCORES

C.A.T. STUDENT PERFORMANCE DATA, 1985

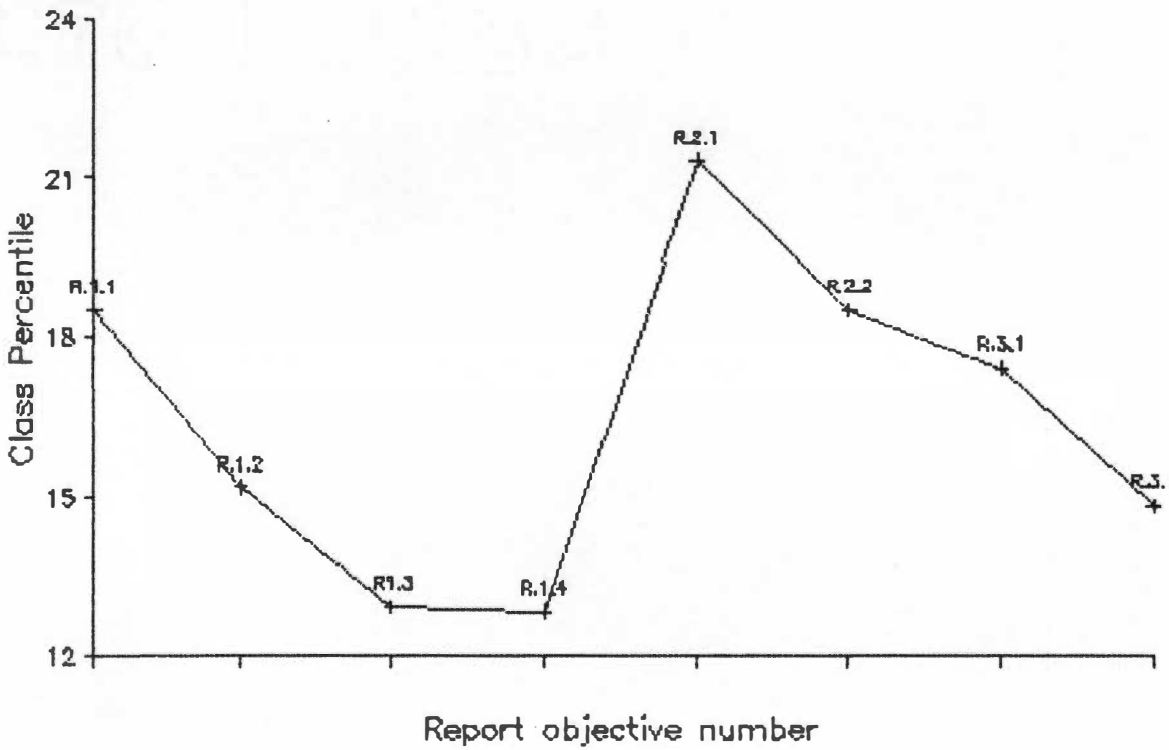
READING: OBJECTIVE DATA

STUDENT INITIAL	CONSONANT CLUSTER	SHORT & LONG V'S	DIPH-THONGS	VARIENT VOWELS	COMPOUND WORDS	BASE WORDS	SAME MEANING	OPPOSITE MEANING
NAME	R.1.1	R.1.2	R1.3	R.1.4	R.2.1	R.2.2	R.3.1	R.3.2
R.L.A	17	10	10	11	17	11	12	14
S.D.D.	22	11	14	9	28	14	9	12
E.J.F.	27	23	19	11	35	22	15	12
C.G.F.	7	5	11	9	12	7	7	15
L.S.H.	11	13	8	8	19	22	10	6
B.R.J	16	13	7	14	18	28	15	19
T.L.K.	37	42	29	20	44	40	35	22
T.R.K.	23	20	11	15	18	20	29	25
M.B.M.	27	15	19	14	24	18	33	17
R.L.P.	8	11	8	19	11	6	11	6
D.R.T.	12	6	9	6	11	15	14	15
M.R.W	15	13	10	18	19	19	19	15
AVERAGE	18.50	15.17	12.92	12.83	21.33	18.50	17.42	14.83

STUDENT INITIAL	MULTIPLE MEANING	RECALL FACTS	INFERRED MEANING	CHARACTER ANALYSIS	FIGURA-TIVE AN.	REAL/ UNREAL	GRADE LEVEL
NAME	R.3.3	R.4.1	R.4.2	R.4.3	R.4.4	R.4.5	GRADE
R.L.A	13	10	10	10	11	15	1.5
S.D.D.	14	9	8	8	9	18	1.8
E.J.F.	14	9	8	9	9	20	2.4
C.G.F.	11	7	7	7	7	10	2
L.S.H.	19	15	6	11	10	2	2.1
B.R.J	22	12	11	9	9	11	2.7
T.L.K.	31	33	19	19	17	28	3.6
T.R.K.	25	28	12	17	22	10	3.1
M.B.M.	20	14	11	9	16	15	2.4
R.L.P.	4	9	5	6	8	17	1.2
D.R.T.	7	9	8	8	11	5	1.5
M.R.W	13	11	7	12	6	6	1.9
AVERAGE	16.08	13.83	9.33	10.42	11.25	13.08	2.18

C.A.T. STUDENT PERFORMANCE DATA, 1985

READING: OBJECTIVE DATA



APPENDIX C

PILOT SESSION SCRIPT FOR SPECIAL EDUCATION TEACHERS

PILOT TEXTBOOK ANALYSIS SESSION

I. Session setup:

A. Apple IIe enhanced computer, 2 drives, 128 K internal memory & Printer with 2 monitors.

Used to run the trial templates with SuperCalc3a

B. Apple IIe, 1 disk drive, 64 K internal memory and monitor.

Used for textbook readability analysis program.

C. Two sample textbooks for analysis:

1. Reading Mastery III
a direct instruction series
Engelmann, S., and Hanner, S.
Science Research Associates,
Chicago, 1983.
2. Widening Circles
Early, M., Cooper, E.K. and Santeusanio, N.
Harcourt Brace Jovanovich,
New York, 1979.

D. Each teacher provides two texts: one that the teacher likes and one that the teacher doesn't like.

II. Decision Support Templates Provided: each template is presented on two computer screens and each teacher has a paper copy.

A. /DATA/GENERAL: Textbook characteristics--A general information checklist that does not analyze the content. Placed first because it is the easiest template for evaluators to follow.

After entering bibliographical data and a short description of the textbook's intended purpose, 27 aspects of the textbook are discussed. Each of the 27 items was requested by several evaluators. A comment and a score may be entered for each item. Then the item value is weighted according to its importance to the evaluators. Items that are unimportant may be weighted "0" and thus dropped from the scoring. Items of minor importance are weighted "1" while items of greater importance are weighted accordingly. Items requested by nearly all evaluators have been pre-weighted at "2."

Only one set of columns is shown for use in evaluating one textbook; additional duplicated columns are available to the right and may be scrolled over into view when additional textbooks are evaluated.

---

1. Identification section: Title, Author(s), publisher, grade level, price, and instructional purpose.

2. Physical textbook qualities:

A-1 copyright date

A-2 binding quality

A-3 page layout

A-4 print legibility

A-5 color illustrations

A-6 illustrations quality

A-7 publisher

3. Supplemental materials available:

B-1 teacher's guide

B-2 workbook

B-3 mimeograph masters

B-4 audio tapes

B-5 computer programs

B-6 other special materials

4. Content and organization:

C-1 readability--either publisher's or from computer analysis.

C-2 target group--the appropriateness for the grade level, age and ability level of the teachers' students.

C-3 background required--the appropriateness in terms of student reading level, previous coursework, and experiential background (for example, rural/urban).

C-4 student interest level--the appeal to students; special subject matter, age appropriateness, etc.

C-5 content diversity--support for a wide range of student abilities, achievement levels, and interests.

C-6 success potential--is it likely that students will feel successful in using the materials?

C-7 content organization--does the content seem to be logically and consistently organized?

C-8 general approach--is the general treatment of the subject matter appropriate for the students?

C-9 content level--is the conceptual level of the content appropriate for the students?

C-10 explanation quality--are the concepts clearly explained?

C-11 drill and practice--are there enough drill and practice exercises?

C-12 enrichment activities--are enough activities suggested and clearly described?

C-13 instructional methods--is the material organized according to classroom instructional needs: are there pre- and post tests, advance organizers, chapter summaries, review questions, etc.?

General Notes:_____

_____

B. /DATA/NORMAL.3RD: A template for examining textbook content according to the Competency Goals and Performance Indicators, K-12 of the North Carolina Department of Public Instruction.

This is the first of four templates of North Carolina developed objectives--each set presents the goals and objectives in a slightly different manner. The purpose of examining all four is to determine the most effective presentation format.

North Carolina has divided the competency goals into subjects and "strands" and states them by level: K-3,4-6,7-9, and 10-12. For each competency goal a set of one or more performance indicators is specified. The statement of the competency goal alone is inadequate; a brief synopsis of the performance indicators is included whenever needed and possible. A basic familiarity with the goals and indicators is presumed--in most interviews teachers indicated that they were familiar with the goals and indicators for their level.

For the subject of reading, 10 strands are used. Each strand is mentioned, but only the goals for five of the strands are fully outlined in this template.

Number: keyed to NC numbering system for reference.

_____

_____

Strand: Organization themes used by North Carolina.

_____

_____

Screening: An initial evaluation to eliminate books quickly or to show topics not covered. Topics which are not covered in the text may be covered in supplemental materials.

_____

_____

Quality: An evaluation score on how well the text covers a particular objective: 1 = poor, 2 = average, 3 = very good.

_____

_____

Drill: An evaluation of the amount and range of drill and practice exercises provided by the text: 1 = insufficient; 2 = adequate; 3 = ample.

_____

_____

Total: The computer adds the quality and drill scores; multiplying by the screening factor simply drops out any topic that is not covered by the text.

_____

_____

Omitted Strands:

Pre-reading

_____

vocabulary

_____

critical comprehension

_____

appreciation of literature

_____

Developed Strands:

Phonic analysis

_____

_____

Structural analysis

_____

_____

Literal comprehension

_____

_____

Interpretive comprehension

_____

_____

Study skills

_____

_____

Totals: a grand total

_____

_____

General Notes: _____

_____

C. /DATA/OBJECTIVES.3RD: A template for examining content according to the Competency Goals and Performance Indicators, K-12. Educable Mentally Handicapped Learners Supplement of the North Carolina Department of Public Instruction.

Although there is a direct correspondence between these objectives and those stated in the regular booklet, the format is considerably different. Strands are not explicitly stated as separate divisions; instead, each major competency goal roughly corresponds to a strand and the performance indicators represent a lower level of student performance. Because of this lower level, the indicators seem more specific than the indicators for the normal third grade students.

_____

_____

This template provides the "pre-reading" goals and indicators, representing the only level presented for third grade EMH students. However, many of the skills correspond to the skills listed under "phonic analysis" in the preceding template.

_____

_____

General Notes:

_____

D. /DATA/NORMAL.4TH: A content analysis template developed from the Competency Goals handbook. This template illustrates three points:

1. The same competency goal and set of performance indicators cover a wide achievement range: fourth to sixth grade.

_____
_____
_____

2. The strands are not explicitly developed in this template.

_____
_____

3. Specific examples of the performance indicators are added, although no grade level is specified for any of the examples.

_____
_____

General Notes:

_____

E. /DATA/OBJECTIVES.4TH: A template developed from the EMH supplement and covering the same grade levels as the previous template. The template illustrates the addition detail provided by an expanded number of performance indicators.

_____
_____

General Notes:

_____

F. /DATA/BRIGANCE.TOP: A template designed to evaluate textbook content in terms of the objectives the teachers state on their students' IEP forms. All of the Cherokee County teachers at the elementary school level used one of the Brigance Diagnostic Inventory of Basic Skill forms and most developed their IEP forms directly from the Inventory. This template was developed from the Blue version for students with achievement levels between Kindergarden and sixth grade.

The format is tied directly to the inventory. The numbers in the A column represent the enumeration system used by the inventory; the topics represent the major divisons, and the wording is as close to the original as possible.

Objectives C-3 and C-4 are stated in two formats: as they are stated within the actual inventory and in a form suggested for use on a student's IEP.

The objectives in the language section include specific indicators for each grade level.

General Notes:

G. /DATA/REPORT.CAT: A template to examine the textbook content in terms of the competencies tested on the California Achievement Test which is used in the North Carolina annual testing program for grades one, two, three, six and nine. Cherokee County has proposed using these test results--student achievement at or above the 25th percentile--as a condition for student promotion to grades four and seven.

The format is adopted from the grade level report formal of the CAT. This report is developed for each school and given to the principals who may then analyze data on a classroom basis. Again, the topics are roughly comparable to the North Carolina stands and the CAT content roughly parallels the North Carolina competency indicators.

There are no detailed examples of CAT content skills immediately available to classroom teachers.

General Notes:

H. /DATA/OBJECTIVES.COM: A demonstration template for analyzing the textbook content in terms of the competencies required by the North Carolina Competency Test, passage of which is required of all high school students before graduation.

The North Carolina competency goals and performance indicators for high school students are identical to the competencies tested on the North Carolina competency test.

_____

_____

General Notes:

_____

I. /DATA/STUDENT.CAL: A table of the CAT performance of the students in one classroom (hypothetical data developed from results for a special education classroom for the mildly handicapped), and a line graph of developed from the class average on each skill. There are 14 items reported on the CAT; each item is reported in the table; only the first eight items are shown on the graph.

_____

_____

General Notes:

_____

_____

III. Session conclusions:

A. General discussion:

_____

APPENDIX D

TEMPLATE COMPUTER SCREENS* USED WITH COMPUTER SCIENCE TEACHERS FOR ANALYSIS OF TEXTBOOKS

*The following pages are printouts from the computer screen as viewed by the teachers for making their analyses.

TEXTBOOK EVALUATION PROGRAM: TEXTBOOK CHARACTERISTICS

TITLE _____
AUTHORS _____
PUBLISHERS _____
GRADE LEVEL _____ PRICE _____
COPYRIGHT DATE _____ EDITION _____
INSTRUCTIONAL PURPOSE: _____

NO.	CHARACTERISTIC	EVALUATION	RATING	WEIGHT	TOTAL
	Physical textbook qualities:				
A-1	Binding quality is			1	0
A-2	The page layout is			1	0
A-3	Illustration quality			1	0
	Supplemental materials available				
B-1	Teacher's guide			2	0
B-2	Workbook & Mimeos			3	0
B-3	Other materials			1	0
	Content and Organization				
C-1	Readability			2	0
C-2	Target group Background required			3	0
C-3	Content diversity			1	0
C-4	Enrichment activities			1	0
C-5	Approach to subject appropriate/students			1	0
C-6	Approach to subject appropriate/teacher			1	0
C-7	Instructional methods			2	0
C-8	Content level & pace			2	0
C-9	Amount drill & practice			3	0
	Special factors				
S-1				1	0
S-2				1	0
	TOTALS				0

TEXTBOOK EVALUATION PROGRAM: COMPUTER SCIENCE OBJECTIVES

TITLE

HIGH SCHOOL COMPUTER SCIENCE COURSE OUTLINE

NO.	TOPIC	COMPETENCY PERFORMANCE INDICATORS The learner will demonstrate knowledge of	RATING (0 to 3)	DRILL (1 to 3)	SCORE (D*E)
	The History of Computing				
A-1		The generations of computer hardware			
A-2		The generations of computer languages			
A-3		The development of the information society			
	The Information Processing Cycle				
B-1		Input-processing-output-storage			
B-2		Periphal devices			
B-3		ASCII coding			
B-4		Computer capabilities			
	Internal Structure of Computers				
C-1		Central Processing Unit (CPU)			
C-2		Input-output and data bus			
C-3		Memory--RAM and ROM			
	Peripherals				
D-1		Input and output devices			
	Languages				
E-1		Machine language, assembler			
E-2		BASIC, Pascal, LOGO, other			
	Problem Solving Techniques				
F-1		Problem specification			
F-2		Flow charting symbols & development			
F-3		Top-down structures			
F-4		Programming logic & style			
F-5		Program testing and debugging			
	Programming in BASIC				
G-1		Introduction to programming Line numbers, typing errors, PRINT, LIST CTRL-S, NEW, READ, DATA, GOTO, INPUT Print formatting--comma, semicolon, TAB Immediate mode, REM, SAVE/LOAD, CATALOG			

TEXTBOOK EVALUATION PROGRAM: COMPUTER SCIENCE OBJECTIVES

TITLE

HIGH SCHOOL COMPUTER SCIENCE COURSE OUTLINE

NO.	TOPIC	COMPETENCY PERFORMANCE INDICATORS The learner will demonstrate knowledge of	RATING (0 to 3)	DRILL (1 to 3)	SCORE (D*E)
	The History of Computing				
A-1		The generations of computer hardware			
A-2		The generations of computer languages			
A-3		The development of the information society			
	The Information Processing Cycle				
B-1		Input-processing-output-storage			
B-2		Periphal devices			
B-3		ASCII coding			
B-4		Computer capabilities			
	Internal Structure of Computers				
C-1		Central Processing Unit (CPU)			
C-2		Input-output and data bus			
C-3		Memory--RAM and ROM			
	Peripherals				
D-1		Input and output devices			
	Languages				
E-1		Machine language, assembler			
E-2		BASIC, Pascal, LOGO, other			
	Problem Solving Techniques				
F-1		Problem specification			
F-2		Flow charting symbols & development			
F-3		Top-down structures			
F-4		Programming logic & style			
F-5		Program testing and debugging			
	Programming in BASIC				
G-1		Introduction to programming Line numbers, typing errors, PRINT, LIST CTRL-S, NEW, READ, DATA, GOTO, INPUT Print formatting--comma, semicolon, TAB Immediate mode, REM, SAVE/LOAD, CATALOG			

TEXTBOOK EVALUATION PROGRAM: COMPUTER SCIENCE OBJECTIVES

TITLE

HIGH SCHOOL COMPUTER SCIENCE COURSE OUTLINE

NO.	TOPIC	COMPETENCY PERFORMANCE INDICATORS The learner will demonstrate knowledge of	RATING (0 to 3)	DRILL (1 to 3)	SCORE (D*E)
	The History of Computing				
A-1		The generations of computer hardware			
A-2		The generations of computer languages			
A-3		The development of the information society			
	The Information Processing Cycle				
B-1		Input-processing-output-storage			
B-2		Periphal devices			
B-3		ASCII coding			
B-4		Computer capabilities			
	Internal Structure of Computers				
C-1		Central Processing Unit (CPU)			
C-2		Input-output and data bus			
C-3		Memory--RAM and ROM			
	Peripherals				
D-1		Input and output devices			
	Languages				
E-1		Machine language, assembler			
E-2		BASIC, Pascal, LOGO, other			
	Problem Solving Techniques				
F-1		Problem specification			
F-2		Flow charting symbols & development			
F-3		Top-down structures			
F-4		Programming logic & style			
F-5		Program testing and debugging			
	Programming in BASIC				
G-1		Introduction to programming Line numbers, typing errors, PRINT, LIST CTRL-S, NEW, READ, DATA, GOTO, INPUT Print formatting--comma, semicolon, TAB Immediate mode, REM, SAVE/LOAD, CATALOG			

RENAME, DELETE, LOCK, UNLOCK
Editing--cursor moves; CTRL X; ESC A,B,C,D
SPEED; arbitrary starting locations

G-2 Decision and loops
Order of operations
IF ...THEN; entended IF ...THEN
AND, OR, END, FOR ...NEXT, RESTORE

G-3 Computer games
INT, RND, summation, rounding errors
POS, HTAB, VTAB, HOME, FLASH, INVERSE, GET
Game programs

G-4 Nested loops-subscripted variables (arrays)
nested FOR ...NEXT loops
single & double subscripted variables
DIM, CLEAR, extended variable names

G-5 Programming techniques
GOSUB, RETURN, ON--GOTO/GOSUB
Programming planning, debugging
logic and runtime errors
TRACE/NOTRACE; STOP/CONT

G-6 Graphics
GR, TEXT, HOME, COLOR, PLOT, HLIN, VLIN
SCRN, HGR, HGR2, HCOLOR, HPLOT, high
resolution graphics, switching displays

G-7 Mathematical functions
SQR, SGN, ABS, SIN, COS, TAN, ATN, LOG,
EXP, DEF, shifting, scaling

G-8 String functions and data types
Binary code, memory management, data types,
ASCII code, String functions--RIGHT$,
LEFT$, MID$

G-9 Files
Format of file commands
Sequential: OPEN, CLOSE, READ, WRITE, APPEND
Random: OPEN, CLOSE, READ, WRITE
Demo programs, multiple file us, MAXFILES

G-10 Advanced topics
Sorting & searching techniques
PEEK, POKE, SCALE, ROT, DRAW, X DRAW
Shape tables, binary-decimal mathematics

	Uses of Computers:	
H-1	Word processing	
H-2	Spread sheets	
H-3	Data management	
	LOGO programming	
I-1	Graphics, words & lists, variables, math	
	Totals	

APPENDIX E

PILOT SESSION SCRIPT FOR COMPUTER SCIENCE TEACHERS

PILOT TEXTBOOK ANALYSIS SESSION

COMPUTER SCIENCE TEXTBOOK SELECTION

I. Session setup:

A. Apple IIe enhanced computer, 2 drives, 128 K internal memory, monitor & Printer.

Used to run the trial templates with SuperCalc3a

_____

_____

B. Apple IIe, 1 disk drive, 64 K internal memory and monitor.

Used for textbook readability analysis program.

Not used: readability analysis completed before session by one of the computer science teachers.

C. Textbooks for analysis:

Kemeny and Kurtz, BASIC PROGRAMMING--eliminated during initial examination.
Luehrmann and Peckham, COMPUTER LITERACY--eliminated during initial examination.
Daggett, Badrkhan & Kruse, COMPUTERS AND INFORMATION TECHNOLOGY--eliminated during initial examination.

Mandell and Mandell, Understanding BASIC--A Structured Approach.
Bateson and Raygor, BASIC Programming for the Apple Computer.
Mandell, Complete BASIC Programming.
Presley, A Guide to Programming in Applesoft.

II. Decision Support Templates Provided: each template is presented on the computer screen and each teacher has a paper copy.

_____

_____

A. /DATA/GENERAL: Textbook characteristics--
A general information checklist that does not analyze the content. Placed first because it is the easiest template for evaluators to follow.

After entering bibliographical data and a short description of the textbook's intended purpose, 15 aspects of the textbook are discussed. Each of the 15 items was requested by several evaluators. A comment and a score may be entered for each item. Then the item value is weighted according to its importance to the evaluators. Items that are unimportant may be weighted "0" and thus dropped from the scoring. Items of minor importance are weighted "1" while items of greater importance are weighted accordingly. Items have been pre=weighted according to the results of the first pilot session; they may be changed during the current session as desired by the personnel participating.

Only one set of columns is shown for use in evaluating one textbook; additional duplicated columns are available to the right and may be scrolled over into view when additional textbooks are evaluated.

_____
_____

1. Identification section: Title, Author(s), publisher, grade level, price, copyright date, edition, and instructional purpose.

   _____
   _____

2. Physical textbook qualities:

   A-1 binding quality

   _____
   _____

   A-2 page layout (include print legibility)

   _____
   _____

   A-3 Illustration quality

   _____
   _____

3. Supplemental materials available:

B-1 teacher's guide

_____
_____

B-2 workbook and mimeograph masters

_____
_____

B-3 other materials

_____
_____

4. Content and organization:

C-1 readability--either publisher's or from computer analysis.

_____
_____

C-2 target group--do the academic requirements of the text--student reading level and previous coursework/experiential background--match the characteristics of the expected students.

_____
_____

C-3 Content diversity--support for a wide range of student abilities, achievement levels, and interests.

_____
_____

C-4 Enrichment Activities--are enough activities suggested and clearly described?

_____
_____

C-5 Approach to subject: appropriateness for students--is the general approach to the subject matter appropriate for the students?

_____
_____

C-6 Approach to subject: appropriateness for teachers--is the general approach to the subject matter appropriate to the teachers' classroom responsibilities and to the teachers' preferred instructional techniques.

_____

_____

C-7 Instructional methods--is the material organized according to good instructional practices: are there pre- and post-tests, advance organizers, chapter summaries, review questions, etc.?

_____

_____

C-8 Content level & pace--is the conceptual level, instructional pacing, and explanation qualities appropriate to the students.

_____

_____

C-9 Amount of drill & practice--are enough student exercises included?

_____

_____

5. Special factors--any additional items the participants wish to consider.

_____

_____

C. /DATA/OBJECTIVES.CS: A textbook content analysis template developed by the high school computer science teachers.

The teacher designated as the county-wide head of the computer science program developed the course content outline from the chapter and section title of the book he preferred and used (Presley) and added sections on history, internal structure, peripherals, languages, flow charting, computer applications, and LOGO programming.

This outline was entered as a SuperCalc3a template and presented for modification by the other computer science teachers before the actual textbook

selection process began. This produced the actual template used.

As the initial screening process took place before any template analysis was done, the simplified form provided a space for rating the textbook's coverage of each topic on a scale from 0 --not covered,to 3 --excellent coverage.

The amount of drill and practice the textbook provided for each topic was analyzed and rated as 1 --needs additional practice exercises from another source, 2 --adequate exercises provided, and 3 --excellent exercises covering a wide range of achievement levels provided.

The final score summed the products of the rating and the drill evaluations.

General Notes: _____

VITA

Fred B. Wheeler, Jr., was born in Chicago, Illinois, on January 19, 1944. He attended schools in suburban Glen Ellen, Illinois, graduating from Glenbard West High School in June 1962. Following graduation, he studied engineering physics for two years at Cornell University, then took a leave of absence to travel and study in Europe. Upon returning to the United States, Mr. Wheeler attended Indiana University, majoring in political science and minoring in mathematics and philosophy. He graduated, with Departmental Honors, in June 1967.

Having been elected vice-president of the Indiana University Student Government Association for the 1967-68 school year, Mr. Wheeler took graduate courses in the Department of Educational Research in the College of Education until joining the teacher corps program at East Tennessee State University in June 1968. He completed a Master of Arts and Teaching in education with a major in elementary education in August 1969.

Mr. Wheeler taught elementary and high school special education classes in the Clay County, North Carolina, School System from August 1969 until June 1981 when he began his Ed.D. program in curriculum and instruction at the University of Tennessee, Knoxville, specializing in educational

computing and special education. During the 1981-82 school year, Mr. Wheeler received an assistantship in which he supervised Field Experience students in the College of Education. In November 1982, he was elected to the Honor Society of Phi Kappa Phi. From December 1982 to February 1985, Mr. Wheeler was an instructor and chairman of the Department of Business Computer Programming at Tri County Community College in Murphy, North Carolina.

After completing his dissertation field work from February to August 1985, Mr. Wheeler taught mathematics and computer science at Hiwassee Dam High School, in the Cherokee County, North Carolina, School System. He is a member of the Council for Exceptional Children, of the Association for Supervision and Curriculum Development, and of the International Council for Computers in Education. He will graduate with a Doctorate in Education in curriculum and instruction in June 1986.