Curriculum renewal and achievement assessment via computer management systems in mathematics

Ralph F. Woodward Jr.

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Curriculum renewal and achievement assessment via computer management systems in mathematics

Woodward, Ralph F., Jr., Ph.D.
Iowa State University, 1994
Curriculum renewal and achievement assessment via computer management systems in mathematics

by

Ralph F. Woodward, Jr.

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of DOCTOR OF PHILOSOPHY

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For the Graduate College

Iowa State University
Ames, Iowa

1994
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CHAPTER I. INTRODUCTION

"Not everything that counts can be counted and not everything that can be counted counts." A statement reported to have been posted on Albert Einstein's office wall (Marshall, 1992).

Three major waves of educational reform have taken place in the last three decades. Sizer (1992) described the first wave as the oblique strategy. The initiative began at the local level in the mid '80s at the demand of parents and educational leaders dissatisfied with the quality of the education students were receiving. The amount, and not the soundness, of the program was questioned. It was simple--more of the same was needed. Curriculum standards were frequently increased to three years of math, English, science, and sometimes included requirements for a foreign language. Attendance requirements were stiffened and school years extended all in the hopes of increased student performance (Manatt, 1993). Many districts imposed exit exams resulting in a student predicament of receiving a diploma based on a test score. With the increased student dropout rate, more students were seen as being "at risk," demonstrating this logic to be educationally unsound. Unfortunately, it was based on a narrow concept of education. The Carnegie Report (1986) put it this way:

We are doing better on the old goals, often at making progress on the goals that count the most. Because we have defined the problem of schools in terms of decline from earlier standards, we have unwittingly chosen to face backwards when it is essential that we face forward. (pp. 15, 20)

This led to the second wave of reform which was not distinguished by chronology, but by a markedly different agenda (Michaels, 1988). He includes in this agenda 1) the individual school as the unit of decision
making, 2) development of a collegial, participatory environment among both students and staff, 3) flexible use of time, 4) increased personalization of the school environment with a concurrent atmosphere of trust, high expectations, and sense of fairness, 5) a curriculum that focuses on the students' understanding of what they learn, and 6) an emphasis on higher order thinking skills for all students.

Because of the perceived inability of schools to implement meaningful change, governors and state legislators became extensively involved in this wave of reform, changing the direction of the theorists. In the view of the politicians, the focus of creating better teachers who could be held accountable and paid better salaries was the most effective means of educational reform. Career ladders, pay for performance, job enlargement, and quality points were some of the methods employed to bring about improved student performance. Collegiality went by the wayside as teachers competed for the extra pay based on a set of expected performances. Members of professional organizations became distraught over the implementation and the soundness of the criteria used for both pay and promotion. Although new designs and implementation practices for ensuring sound and successful merit programs were developed (Farnsworth et al., 1991; Poston et al., 1991), the basic premise of increased student performance was minimally or not demonstrated at all as a result of these practices.

The third wave of reform included the main points of Michaels' construct, but with an additional emphasis. The leaders were the politicians and business leaders from the Governors Conference, the
Business Roundtable, and the White House. Manatt (1993) states the flow of logic encompassed setting goals or outcomes for schools, giving educators and schools great leeway in how they meet the goals or provide the outcomes and then holding them accountable. The goals were "world class" and accountability was the demand by the politicians, employers, and taxpayers for school officials to show the results of the money annually invested in education. Not all believed this wave would succeed any better than the previous two. Lamar Alexander, the former Education Secretary, flatly stated that "the problem is the system" (p. 16) and during his tenure was actively promoting a voucher system to provide alternatives to public education. Chris Whittle (1992), with his controversial Edison Project, is seeking to alter the future by providing private schooling for profit. He wants the freedom to try to create new conceptions on a completely clean slate, without the constraints of inherited institutions. He does not believe that gradual reform will likely produce the improvements the country desperately needs.

The clear message of this wave of reform is the need to examine basic philosophical beliefs about teaching, learning, the nature of students, and the kinds of environments that maximize growth for both teachers and students. A great need exists to sort out personal values, develop new belief systems, and ultimately create schools that educate as well as train schools that foster learning in all ways it can occur (Michaels, 1988). The primary task of the teacher, in fact, should be to structure events and activities so as to bring young people across the threshold of a commitment to learn.
When giving teachers great leeway, it appears logical that an outcome based approach to education must be used to properly fit the new paradigm at the building level. If the state and the nation mandate outcomes, teachers and their instructional procedures must use a curriculum alignment process in order to infuse the goals and standards into daily instruction. The intent of the outcomes based approach is to start with what you want a graduate at the twelfth grade "to know, be, and do." Next the curriculum planner or the district curriculum committee must align the teaching and learning experiences. This approach is properly known as OBE (Outcome Based Education). OBE alone probably will not change the amount of student achievement obtained, unless a mastery teaching strategy is also used. Mastery teaching, usually associated with the work of Benjamin Bloom and John Block, calls for a cycle of pre-test at the start of the unit, teach the unit, and then post-test for learning change. Next, the teacher provides extending and refining experiences for those who have mastered the content while reteaching is provided for those who have not. Needless to say, all of this is a tall order, when the teacher has many students and the process is one provided manually by paper and pencil test, hand scoring, and recording progress on a wall chart or in the grade book. Thus, curriculum management systems that are microcomputer based soon become an obvious need. A reference of selected, commercially available software can be found in Chapter II.

Previous research at Iowa State University, spanning the years 1978 to 1992, has developed a methodology for curriculum renewal, alignment, and curriculum driven testing (Manatt & Stow, 1986; Manatt & Holzman,
has resulted in detailed curriculum guides for all subjects, all grade levels, kindergarten through 12. In addition, criterion measures have been developed in Minnesota, Florida, Wyoming, and Arizona. Unfortunately, these efforts require 36 months of time and many days of participation by teachers across all subjects and at each grade level. This approach is costly (e.g., $180,000 for Arizona). Obviously, there is a need for a quicker way to bridge from an existing curriculum to this more robust scope and sequence containing a detailed array of learner outcomes coupled with carefully piloted assessment items. A developmental study to create this "bridging" capability is needed. In addition to the challenge of doing it faster and at less cost, ownership by the faculty for this new assessment approach is a must. Furthermore, knowledgeable teachers in the 1990s need assurance that some non-traditional testing (sometimes called authentic assessment) will be included.

The present investigation was conceived as an experiment to determine how to bridge from the existing School Improvement Model (SIM) process and product (curriculum renewal, robust scope and sequence, and curriculum driven assessment) quickly, inexpensively, but with the requisite faculty buy-in (ownership).

The elementary unit of the public schools in Gilbert, Iowa was selected for this experiment because of its culture and previous efforts at transformation. The culture includes a well-established building level team and shared decision making. The previous work accomplished includes staff development for all teachers and the Lezotte approach to effective
schools provided by Dr. William Rauhauser, previously trained by the School Improvement Model project at Iowa State University (1982-83). In addition, the district has spent two years developing outcomes, standards, and a curriculum scope and sequence for the basic subjects.

While the culture and the previous work accomplished in the Gilbert district are admirable and necessary precursors to the proposed experiment, they caused such strong ownership on the part of the faculty for previous practices that it required slow and deliberate negotiations to bring the entire faculty to a decision point to launch the experiment. This long-term effort is best understood by reading the materials in the appendix in calendar sequence.

Statement of the Problem

Districts have a need for a valid curriculum driven assessment which includes curriculum renewal and curriculum alignment which introduces the latest recommendations in curriculum content from the scholarly associations. The School Improvement Model projects office at Iowa State University has such curricula and rigorously tested assessment items. Because of the complexity of this process, it must be computer based. It is the intent of this study to provide the model of procedures to facilitate moving from existing curriculum to this more appropriate curriculum and to provide the plan necessary for this to occur.

Due to the nature of this study, the statement of the problem and the questions posed are not intended to generate hypotheses to be tested empirically. It is the intent to 1) provide a model of procedures for
future use to facilitate the movement towards results based education, as
the term relates to the development of skills and concepts, and mastery
learning, 2) provide a rubric useful to practitioners nationwide in
implementing those outcomes, and 3) provide an initiative for the
implementation of mastery teaching and mastery learning.

The following questions define the problem:

1. What specifications for curriculum outcomes can be identified in
the curriculum of a progressive small district which has given
considerable effort to the planning process in the past three
years?

2. How can the very complex and detailed SIM curriculum and the
array of assessment items be properly connected to that
district's curriculum?

3. How can interval or segmented testing be built upon summative
testing now a part of the School Improvement Model?

4. What are the primary steps in developing procedures for formative
evaluation of students rather than pre/post summative testing?

5. Do different levels of teacher participation impact the
acceptance of any model developed (active participants vs. user
of the product)?

6. What specifications, with and without summative measures, are
appropriate for formative testing?

7. If teachers, students, parents, and administrators are going to
be accountable for student achievement, how is information
regarding progress going to be provided to parents and students?
8. How can a computer management system facilitate the entire process?

Purpose of the Study

The purpose of the study will be to:

1. assist in the standards and outcomes mandate by providing a model useful to the practitioner;
2. help reduce the amount of clerical paperwork for teachers and administrators through the use of computer technology;
3. serve the performance based education effort of the district;
4. improve the reporting of the massive amounts of achievement performance data for all stakeholders by using commercially available software to report different kinds of aggregated data;
5. determine the value and need for formative assessment through the review of literature;
6. determine the feasibility of using locally generated learner outcomes and test items, SIM learner outcomes and test items, and Project Assure™ test items, after adjusting them to the Gilbert Elementary School curriculum via a pilot test;
   a. determine the reliability of the test items using the Kuder-Richardson 20 analysis;
   b. determine the discrimination power of each item on the summative test, using the mainframe based computer package called Standard Examination Analysis;
c. validate new and original test items developed by the Gilbert teachers, which will be the pilot test process; and

7. document all of the steps and processes needed to operate this fast-track program of curriculum driven assessment and to teach the process to the Gilbert administration and faculty. This will provide a manual for teaching the process to other districts.

Objectives of the Study (Subgoals)

The objectives of the study are to:

1. develop a methodology for speeding up the development of curriculum aligned testing;

2. obtain a district which will cooperate in the experiment;

3. obtain permission from an established manufacturer of computer software packages capable of managing, assessing, and reporting student achievement to use its materials for the pilot test;

4. select the pilot test subjects (both the students and academic subjects) and teachers;

5. obtain human subjects release for the participants;

6. develop a template to bridge existing School Improvement Model components to the Iowa outcomes based education, as the term relates to the development of skills and concepts, and district curriculum;

7. select or create additional learner outcomes and test items to serve the needs of formative testing regardless if mastery teaching or conventional teaching is utilized;
provide a skills and concepts assessment process; and

prepare a manual to serve as a handbook for future development of
curriculum driven assessment based upon the SIM research.

Basic Assumptions

1. The outcome based approach selected by Gilbert and numerous other
districts will persist in spite of the lack of state mandated
outcomes.

2. Teachers will select appropriate activities and test items given
a properly arranged set of choices.

3. A computer package exists that can manage student performance
data which will facilitate formative testing.

4. Gilbert Elementary School is representative of other small
districts in its progress toward improved curriculum alignment
and assessment.

Delimitation or Scope of Investigation

1. This experiment will be delimited to the Gilbert School District

2. The study will involve only fifth and sixth grade mathematics.

3. The computer software package will be the Instructional
Management Systems Performance Plus™ provided by National

4. The data gathered are limited to mathematics at the fifth and
sixth grade levels.
3. The computer software package will be the Instructional Management Systems Performance Plus™ provided by National Computer Systems (NCS) Corporation.

4. The data gathered are limited to mathematics at the fifth and sixth grade levels.

5. Only conventional instruction and materials used by the Gilbert fifth and sixth grade teachers will be utilized.

6. Formative components will be based on existing summative components from the School Improvement Model and teacher-made and textbook items from the Gilbert Elementary School.

Definition of Terms

Criteria - A standard or test that can be used to judge performance.

Criterion-referenced measure - Test items that relate directly to the written objectives of the instructional program.

Curriculum alignment - The match between the written, the taught, and tested curriculum.

Curriculum assessment - The evaluation of information and material.

Curriculum renewal - The process of reviewing a curriculum to determine needed additional material.

Formative evaluation - The use of systematic evaluation in the process of curriculum construction, teaching, and learning for the purpose of improving any of the three processes (Bloom et al., 1971, p. 117).
Mastery learning - A model of learning in which all students are expected to achieve over time the mastery of predetermined subject matter and skills.

Rubric - Scoring or grading or (conceivably) ranking guide for a test.

SIM - The acronym for Iowa State University College of Education School Improvement Model. The model was developed by a team of researchers headed by Richard Manatt and Shirley Stow working under the auspices of the Research Institute for Studies in Education (RISE).

SIM I - The first model developed by the Iowa State University researchers focused on performance appraisal of certified personnel.

SIM II - The second model developed by the Iowa State University researchers for the purpose of curriculum renewal and assessment.

Stakeholders - All persons who have a direct interest in the operation and effectiveness of a school.

Summative evaluation - A judgment that is made about the student, teacher, or curriculum with regard to the effectiveness of the learning or instruction, after the learning or instruction has taken place (Bloom et al., 1971, p. 117).


Valid test items - Items that measure what they are intended to measure.
CHAPTER II. REVIEW OF LITERATURE

Introduction

A major part of the review includes studies that provide the impetus for the American public education system to transform into a "world class" system. There are five sections to the review: 1) a review of the mastery learning methodology and its implications for high student achievement; 2) a discussion of the theories and comparisons of evaluation methodologies of student achievement; 3) related information on microcomputer software for data management and an evaluation of its ability to manage large amounts of data generated by segmented testing; 4) the School Improvement Model (SIM) at Iowa State University; and 5) a summary of the chapter including the need for change in the American educational system.

Many categories of information were reviewed. They included broad based professional journal articles as well as specific studies found in dissertations and position papers. Initial information sources were library indexes, Educational Administration Abstracts, Dissertation Abstracts, Educational Resources Information Center (ERIC), Encyclopedia of Educational Research, Review of Research in Education, Scholar, InfoTrack, and other collections of educational research studies. Citations in books and journals and from personal interviews with human resources comprised the remaining categories.

Several limitations of the research procedure should be noted:
1. No systematic studies of sources outside of the United States were included.

2. Some of the studies were from published sources which tended to report only those articles with significant results.

3. Other contributions to the existing body of literature may have been excluded from the present study due to time constraints.

Mastery Learning

Historically, educators expended a great deal of effort to accurately assess a student's aptitude for learning. Aptitude was believed to define the level to which a student could learn a particular subject and to have a great predictive value of student achievement. Those students with high aptitude would be able to learn complex material while those students with low aptitude would be able to learn only the very basic elements of material presented. When aptitude was seen in this way, students were perceived as either good learners (high aptitude) or poor learners (low aptitude) (Guskey, 1988).

Carroll (1963) challenged these attitudes about aptitudes. He suggested that aptitude more accurately reflected an index of learning rate. All students had the potential to learn quite well, but differed in the time required to do so. Some students had the ability to learn material quickly, while others took considerably longer. Nonetheless, both were able to learn. When aptitude was seen as an index of learning rate, students were not simply good or poor learners but fast and slow learners (Guskey, 1988). Carroll believed that if a student could be
allowed the time needed to learn a subject, then the student would probably attain the expected level of achievement if the student's time was well spent. If, on the other hand, insufficient time was allowed, then the student would learn much less. Therefore, the extent of learning attained by a student could be expressed by the following formula:

\[
\text{Degree of Learning} = f \frac{\text{Time Actually Spent}}{\text{Time Needed}}
\]

(Carroll, p. 730).

The degree of learning was a function of the time a student actually spent on acquiring knowledge in relation to the time the student needed to spend in order to master the material. If the learning time spent was equal to the time needed, then \( f = 1 \) and the degree of learning was optimized. On the other hand, if the time was less than the time needed, learning was not optimized and \( f \) became less than whole (Guskey, 1988, p. 85).

Carroll (1963) proposed a more complex group based conceptual model of the factors which affected success in school learning. The premise in his model was that "the learner will succeed in learning a given task to the extent that he spends the amount of time that he needs to learn the task" (p. 725). Carroll's model proposed that the degree of learning which took place in the course of instruction was a function of the time actually spent in direct learning activities divided by the time needed. He further proposed that the time actually spent would be a function of 1) the opportunity provided for learning; 2) the amount of time the learner was willing to engage actively in learning (perseverance); 3) the amount of time that was needed to learn (aptitude); and 4) the factor of the quality of education and the student's ability to understand the
instruction. Carroll defined these qualities in terms of time, opportunity, perseverance, and aptitude. These represented the numerator in his degree of learning equation. The denominator was the time needed to learn after the adjustment for the quality of instruction and the student’s ability to understand the instruction (Cooley & Lohnes, 1976). The degree of learning achieved by a student could be expressed by the following equation:

\[
\text{Degree of Learning} = \frac{\text{Opportunity to Learn}}{\text{Perseverance}} \times \frac{1}{\text{Learning Rate}} \times \frac{1}{\text{Quality of Instruction}} \times \frac{1}{\text{Ability to Understand the Instruction}}
\]

(Carroll, 1963, p. 734).

The formula made it clear that the quality of instruction and the student's ability to understand the instruction interacted to determine how much time was needed for the student to learn the material presented (Guskey, 1988, p. 85).

Figure 1 provides a diagram of the key features of Carroll’s model as described by Cooley and Lohnes. When Carroll proposed this model, he admitted that quality of instruction was "the most elusive quantity in the model" (Carroll, 1963, p. 729). He believed that there were three factors that would enhance the quality of instruction. First, "the learner must be told, in words that he can understand, what he is to learn, and how he is to learn it" (p. 726). Second, "the learner must be put into adequate sensory contact with the material to be learned" (p. 726). Finally, "the various aspects of the learning task must be presented in such an order
and with such detail that, as far as possible, every step of the learning is adequately prepared for by a previous step" (p. 726).

Although Carroll believed that quality of instruction was the most elusive variable, Cooley and Lohnes (1976) propose that the ability to understand instruction is even more elusive. According to them, Carroll seemed to be suggesting that "quality of instruction" and "ability to understand instruction" were variables in "the importance of the goodness of fit between the prerequisite abilities which a lesson requires and the student's entering abilities, and whether sound learning principles were built into the lesson..." (pp. 188-189). Figure 2 suggests their revision
of Carroll's model, taking into consideration Gagné's (1974) and Glasser's (1962) belief that the performance of the learner is a "function of the initial characteristics of the learner at some point in time and the classroom events which have taken place since that time" (pp. 190-191).

Cooley and Lohnes (1976) described the four classroom process constructs as follows:

1. Opportunity represents the possibility for learning what is sampled in the criterion performance measures. If, for example, the criterion performance is a measure of arithmetic skills, then the amount of time in which the student could work on those arithmetic skills in the classroom would be an appropriate opportunity measure.
2. Motivation can be viewed as being internal or external. By internal motivation, we mean those sets of behaviors and attitudes that tend to support high rates of learning activity. ...External motivations [are] those elements that can be built into an educational environment to increase the likelihood of an individual engaging in and sustaining learning activities. ...[For example] teacher reinforcement for on-task behavior and instructional materials that appear to interest the students.

3. The structure construct deals with the degree to which a curriculum is organized and sequenced, the specificity of the objectives, and the manner in which a student and a curriculum are matched.

4. [The instructional events] concern the content, frequency, quality, and duration of instructional contacts. It is different from structure in that it is primarily perceived as an interpersonal contact between a student and a teacher or among students. (pp. 191-192)

Bruner (1966), in his book Toward a Theory of Instruction, differed as to the essential features or critical variables that were to be included in a model of instructional process. He indicated that a theory of instruction must specify:

1. The experiences which predispose a student to learn.
2. The ways in which the materials to be learned can be organized in an optimal form, both from the point of view of the student's ability level and the subject matter to be learned.
3. Effective sequences for the arrangement of elements of the instructional program.
4. The nature of the rewards and punishments to be used during instruction, including the ways in which instruction can move from immediate and extrinsic rewards, to delayed and intrinsic rewards.

Bugelski (1964), when interpreting Bruner's theory of instruction, said:

It asks teachers to know their own subjects well, actually very well (the structure principle); to teach them systematically (the sequence principle); to consider and develop the student's interests (the motivation principle); and to make sure that the
educational experience is a satisfying one (the reinforcement principle). (pp. 254-255)

Bruner's motivational and reinforcement ideas were included in the motivator variables, and his structural and sequence features were included in the structure variables. Therefore, the present model also includes the features which Bruner believed must be included in instructional theory (Cooley & Lohnes, 1976).

Gagné (1975) organized instruction into learning phases which corresponded to internal processes representing "those interactions of external stimulation and learning processes which most clearly alter the course of learning" (p. 25). His phases of learning, along with appropriate instructional activities, can best be described by Table 1.

Gagné provided a scheme for organizing the observation of "instructional events that occur in classrooms which is derived from a model of learning structures and processes" (Cooley & Lohnes, 1976, p. 187). Cooley and Lohnes believed that these seven phases suggested a way of scaling relevant dimensions of the classroom environment, relevant at least to the learning that was taking place in the classroom.

The foundation for much of this work was the pioneering research done by Benjamin S. Bloom in the mid '60s, with his studies of human variabilities, at the University of Chicago. He became interested in how teachers might change teaching and learning practices in order to provide higher quality instruction for a larger portion of the students taught. Bloom was interested in discovering ways whereby all students would learn well, and as a result, "reduce the variability that typically exists in students' level of achievement" (Guskey, 1988, p. 48). Figure 3 is an
Table 1. Phases of learning (adapted from Gagné, 1975, pp. 28-29)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Instructional event(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>The preparation for learning by appealing to student interests. Teacher relates this interest to what the student will be able to do once the activity is learned.</td>
</tr>
<tr>
<td>Appending</td>
<td>The teaching is concerned with raising the level of awareness in the area to be taught.</td>
</tr>
<tr>
<td>Acquisition</td>
<td>This phase of learning includes a coding process for long-term retention.</td>
</tr>
<tr>
<td>Retention</td>
<td>This phase pertains to &quot;storage&quot; and completes the knowledge base. Recall of instructional events during this phase may take the form of providing cues to retrieve knowledge.</td>
</tr>
<tr>
<td>Generalization</td>
<td>Teacher provides situations calling for the transfer of learned knowledge.</td>
</tr>
<tr>
<td>Performance</td>
<td>Instruction oriented toward setting situations for the student to demonstrate that the material has been learned.</td>
</tr>
<tr>
<td>Feedback</td>
<td>This phase is the confirmation of the student expectation resulting, hopefully, in reinforcement.</td>
</tr>
</tbody>
</table>

Illustration of the relation of aptitude to achievement under uniform instruction.

When instruction was uniform, with tests and quizzes given as a summative evaluation, the amount of achievement is fairly dependent on student aptitude. Bloom discovered that in most cases only about 20 to 30 percent of the students in a class really learn well what the teacher sets out to teach (Guskey, 1988).
Although Bloom (1988) believed that dividing material into small sequential units and checking students' learning by means of quizzes and tests at the end of each unit was a useful instructional technique, he felt that the tests and quizzes typically used by teachers did little more than tell them who was doing well and who was not. Missing was some form of more meaningful feedback and corrective process. Such checks on student performance could be used not only for grading and evaluation but also to diagnose individual learning difficulties (feedback) and to prescribe specific remediation or reteaching procedures (correctives).

Bloom (1968) outlined how feedback and correctives could be used in what he called a "mastery learning" instructional strategy. Instead of using tests and quizzes as end of unit markers, they would primarily be used to give students information or feedback on their learning. He suggested calling these formative tests, meaning "to give information."
With the feedback and corrective information, each student had a specific prescription of what still needed to be done before mastery of the material or unit was achieved (Guskey, 1988). Figure 4 illustrates this instructional process.

Figure 4. The mastery learning instructional process (adapted from Guskey, 1988, p. 52)

As a result of using a group based mastery learning, Bloom (1976; Bloom, Hastings, & Madaus, 1971) firmly believed that this sequence of formative testing and systematic correction of learning difficulties would provide each student with a better and more appropriate quality of instruction than is possible with more traditional approaches. He

\(^1\)There are three primary forms of mastery learning. The Personalized System of Instruction (PSI) is used primarily at the post-secondary level (see Keller [1968] for a complete description). A second form is called Continuous Progress (CP) mastery learning theorized by Cohen (1977). Group-based mastery learning or Learning for Mastery (LFM) is the third form (Bloom, 1968). This third form is the primary focus of this literature review.
believed that students would become more similar in terms of their achievement, their motivation for future learning, and "perhaps even the rate at which they learn" (Guskey, 1988, p. 52). Figure 5 illustrates the relationship of aptitude to achievement under what Bloom described as "optimal instruction."

![Optimal Instruction](image)

**Figure 5.** The relationship of aptitude to achievement under optimal instruction (adapted from Mayes, 1988, p. 10)

If students were normally distributed on aptitude but each received optimal (quality) instruction and received the learning time needed, then the majority of the students would attain mastery. There was little correlation between aptitude and achievement under these conditions. With the same level or standards of achievement expected, under uniform instruction 80 percent or more of the students in a class would typically achieve what 20 to 30 percent did under more traditional instruction (Bloom, 1981).

As with any theory, mastery learning has been the subject of cautious scrutiny and critique in a number of scholarly studies. Anderson and
Jones (1981) identified five "flaws" as being characteristic of what they determined "less than successful mastery programs." These were:

1. Failure to establish priorities among instructional objectives. Given the realities of subject matter, some objectives are more important than others....
2. Failure to organize objectives into instructional units and to sequence the units based on rational or empirical considerations.
3. Failure to properly orient students...to specify, in advance, the duration of the teaching units and the tentative dates for the formative tests and the amount of time devoted to the corrective learning.
4. Failure to make rational, justifiable decisions about performance standards. [These] standards should be set based on [the] answer to the question, "What evidence will I (we) accept that learning has occurred?" ...standards should be set after careful examination of the objectives...and may differ from objective to objective.
5. The tendency to over test. (pp. 122-123)

Levine (1985), in his book Improving Student Achievement Through Mastery Learning Programs, identified four additional shortcomings to these flaws:

1. Neglect to include higher order thinking skills.
2. Neglect of students' enjoyment and interest in learning.
3. Failure to coordinate mastery learning instruction with other instructional approaches.
4. [Teachers] resort to slow pacing of instruction in order to keep student groups at closer levels of instruction. (pp. 121-123)

In addition to the shortcomings stated by Levine, one might consider the following disadvantages:

1. The increase in record management for teachers.
2. The increase in initial time devoted to planning and implementing a mastery learning program.
3. The increase in organizational difficulties such as keeping track of student progress. (Kuhn, 1985)

Slavin (1987), in his review of equal time studies (of at least four weeks duration), found only modest gains on experimenter-made measures and
no gains on standardized achievement measures when group based mastery
learning techniques were used. He attributed this to the possibility that
"the quality of training, follow-up, and/or materials used to support the
mastery learning approach [were] inadequate...and the amount of corrective
instruction [was] simply not enough to remediate the learning deficits of
low achievers" (pp. 204-205). He concluded by stating:

Mastery learning theory and research has made an important
contribution to the study of instructional methods. However, to
understand this contribution it is critical to fully understand
the conditions under which mastery learning has been studied,
the measures that have been used, and other study features that
bear on the internal and external validity of the findings.
(p. 208)

In consideration of the disadvantages, it should be noted that the
increased workload of the teachers and administrators is a problem to be
solved (Kuhn, 1985). If mastery learning is to be implemented, the
increased time spent for initial planning and implementing the mastery
learning program, along with the increased organizational problems
created, need to be considered carefully (p. 51).

It would appear that many of the disadvantages attributed to mastery
learning are not necessarily due to its design, but the consequence of
theory implementation and practice. In spite of these difficulties,
mastery learning techniques have produced impressive gains in student
achievement (Kulik, Kulik, & Bangert-Downs, 1990). The goal of
universally high student achievement through the use of mastery learning
techniques can be achieved if three assumptions are made: 1) instruction
is segmented into separate skills which are arranged hierarchically
according to difficulty; 2) teachers engage in teach/formative test/
corrective activities/formative test instructional cycle; and 3) students are given time needed to learn a skill before progressing to the next skill in the hierarchy (Mayes, 1988).

Summary

Mastery learning, as developed by Carroll (1963), was based on the assumption that all children could learn the basic concepts presented in an elementary school program if given enough time. Bloom (1964, 1971, 1981; Bloom et al., 1971) designed the instructional program, mastery learning, based on Carroll's model. Bloom's solution to the concept of achievement was defined as time on task. The assumption of time on task was that, given enough time to complete a task, the student would master the material. As many as 95 percent of all students could achieve mastery if their instruction was broken into small, measurable, discrete units of learning and presented in understandable language (Linden, 1992).

Instruction follows a diagnostic test-correctives cycle with formative and summative evaluations determining progress or achievement and eventual introduction to the next unit. Frequent feedback was provided to the teacher which formed the foundation for the correctives, and to the student in the hopes of reinforcing learning. Clear and precise behavioral objectives specify the exact tasks by which the material was to be learned. The basic assumption that some students take longer than others to master materials was the foundation of the learning for mastery model.
The challenge to the effectiveness of the learning for mastery model focuses more on the application and the exactness of the behavioral objectives used in implementing the model than on the model itself. There was concern that these behavioral objectives were based frequently on incorrect sequencing of hierarchical skills required for effective learning (Linden, 1992, pp. 424-425).

Another challenge was that raised by Phylis Shlafly of the religious right who believed that a program such as mastery learning was nothing more than "...a dumbed-down, egalitarian scheme that stifles individual potential for excellence and achievement by holding the entire class to the level of learning attainable by every child" (Manatt, 1994, p. 18). Arguing with such extremism would be time wasted. The firm belief that all children can master 90 percent of subject matter taught (the very best students already do) would be a powerful demonstration, since such achievements of excellence are seldom realized in education.

Testing

Testing has been part of human society since the beginning of recorded history. The Chinese used formal assessment procedures by 1115 B.C. in deciding who should be assigned different positions in the civil service of China (DuBois, 1970). Since that time scientists, psychologists, educational diagnosticians, and teachers have looked for better methods than personal intuition to assess an individual’s potential in order to provide better interventions and treatment programs (Sandals, 1990).
Austin and Panos (1971) believed evaluation to be the collection of information regarding the impact of an educational program. "Although there are many possible uses for such information,...the fundamental purpose of evaluation is to produce information which can be used in educational decision making" (p. 733). These decisions would be concerned with the continuation, termination, or modification of an existing program, or with the development and possible adoption of some new program for the benefit of increased student achievement. Evaluation was most likely to produce useful information if it was based on an understanding of the nature of the test desired (p. 733).

Norm-referenced and criterion-referenced tests

Although frequently misunderstood or misinterpreted, there is a wide acceptance of tests by society for the purpose of both assessing student achievement and a school's teaching performance. There are two types of tests commonly used to measure student performance: norm-referenced and criterion-referenced tests. Certain kinds of test data determine a student's "place" or "rank" in comparison to a norm or average of performances by other students. A test that yields this kind of information is called a norm-referenced test (NRT). Some examples of norm-referenced tests are: Comprehensive Test of Basic Skills (CTBS), California Achievement Test (CAT), Iowa Test of Basic Skills (ITBS), and Iowa Test of Educational Development (ITED). The information derived from these tests is based on the performance of a large sample of students assumed to have similar characteristics as the student being measured.
This type of information is useful for only certain types of decisions (Kubiszyn & Borich, 1987).

The second type of data provided by tests provides information about a student's level of accomplishment or mastery of an identified skill or set of skills. This is derived by comparing a student's performance to an established standard or level of mastery called a criterion. A test that yields this kind of information is called a criterion-referenced test (CRT), since it conveys information referring to a set standard of criterion. This information says nothing about a student's standing or rank compared with other students nationally but provides information on the specific needs of a student in relation to a particular skill or set of skills and knowledge of concepts. It is important to note that students can be compared in a class, school, or district in the degree of mastery. Figure 6 illustrates the relationship between norm-referenced and criterion-referenced tests and the purpose of each.

The importance of identifying the type of information needed before administering a test cannot be overemphasized. Kubiszyn & Borich (1987) pointed out that:

If you fail to do so, you may have test data, but be unable to use the data to make necessary decisions. Unfortunately, teachers often know little more about a student after testing than they did before testing. In our technically oriented society, test scores have sometimes become ends in themselves while the meaning of the test scores has tended to be ignored. With methods of measurement sometimes comes the illusion that the scores themselves are what is important, not the judgment criteria by which the scores must be interpreted and made meaningful for [sound] decision making. (p. 24)

Manatt (1993a) maintained that test items must be designed carefully if they are to determine accurately how much students know at any point in time. Criterion-referenced measures of student mastery provided
information on achievement of students relative to a set of instructional objectives or skills identified as an essential part of the curriculum. This curriculum is identified by a specified scope and sequence of learner outcomes. He stated that in order to make such inferences, the following must be in place: 1) a clearly defined core curriculum consisting of essential skills and concepts, 2) specific objectives corresponding to the skills and concepts in the core curriculum, 3) a representative sample of
student performance for each objective, and 4) a standard proficiency for each objective (p. 47). The specificity of the criterion-referenced test is its advantage in yielding accurate information about specific students.

On the other hand, a norm-referenced test tends to be quite general. Although it measures a variety of skills at one time, it fails to measure them as thoroughly as a criterion-referenced test, since it frequently assesses only a small fraction of the taught curriculum. Thus, it is uncertain to what extent individual students have mastered the skills being assessed. It is possible, however, to arrive at an estimate of student ability in a variety of skills in a relatively short period of time. Such assessments would be valuable in broad curricular decisions but of little real value in judging individual student achievement. Two uses are paramount: 1) They measure how well a student, school, or district is achieving in comparison with the normative group which is representative of a defined population; and 2) the scores can be used to do a needs assessment of an entire global curriculum area (i.e., mathematics, science, language arts, etc.) (Wilson & Stow, 1990). "Since there is a trade-off in the uses of criterion-referenced and norm-referenced measures, there are situations in which each is appropriate" (Kubiszyn & Borich, 1987, p. 28). Determining the appropriateness of the type of test to be used is the key to its usefulness in the type of decision to be made. Table 2 illustrates the differences in norm-referenced and criterion-referenced tests.

The difficulty of test items in a norm-referenced and a criterion-referenced test differs greatly. In the former, items vary in difficulty
Table 2. Comparing norm-referenced tests (NRT) and criterion-referenced tests (CRT) (adapted from Kubiszyn & Borich, 1987, p. 29)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>NRT</th>
<th>CRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of students who get an item correct</td>
<td>50%</td>
<td>80%</td>
</tr>
<tr>
<td>Compare a student's performance to</td>
<td>The performance of other students.</td>
<td>Standards indicative of mastery.</td>
</tr>
<tr>
<td>Breadth of content sampled</td>
<td>Broad, covers many objectives.</td>
<td>Narrow, covers a few objectives.</td>
</tr>
<tr>
<td>Comprehensiveness of content sampled</td>
<td>Shallow, usually one or two items per objective.</td>
<td>Comprehensive, usually three or more items per objective.</td>
</tr>
<tr>
<td>Variability</td>
<td>Since the meaningfulness of a norm-referenced score basically depends on the relative position of the score in comparison with other scores, the more variability or spread of scores the better.</td>
<td>The meaning of the score does not depend on comparison with other scores; it flows directly from the connection between the items and the criterion. Thus, variability may be minimal.</td>
</tr>
<tr>
<td>Item construction</td>
<td>Items are chosen to promote variance or spread. Items that are &quot;too easy&quot; or &quot;too hard&quot; are avoided. One aim is to produce good &quot;distracter options.&quot;</td>
<td>Items are chosen to reflect the criterion behavior. Emphasis is placed upon identifying the domain of relevant responses.</td>
</tr>
<tr>
<td>Reporting and interpreting considerations</td>
<td>Percentile rank and standard scores are used.</td>
<td>Number succeeding or failing or range of acceptable performance used (e.g., proficiency achieved).</td>
</tr>
</tbody>
</table>
from quite easy to those that few are able to answer correctly. The distribution of the range of scores usually follows that of the normal curve. The latter tends to have items equivalent to each other in difficulty. Since the test items follow the taught curriculum closely, the distribution of the range of scores tends to be skewed resulting in a J-shaped curve, indicating a larger percentage of students answering a greater number of questions correctly (see Figure 5).

Perhaps the most compelling argument for criterion-referenced tests is their diagnostic and clinical aspects (Manatt, 1993a, p. 23). The information gained from these tests can be used to direct instruction to the areas the student has not yet learned if there is a clearly defined sequence of learning activities (i.e., specified in a scope and sequence of a curriculum guide). Mastery learning depends on criterion-referenced measures to determine when a student has achieved a certain level of proficiency and is ready to move on to the next unit or level of learning. Classroom instruction usually takes place with some objective in mind. A test usually determines if an objective has been reached. The three-stage classroom measurement model in Figure 7 illustrates the relationship of constructing a criterion-referenced test.

Stage one is the first step in constructing a criterion-referenced test (and, in the opinion of the writer, also sound instructional planning). The task is made easier if the objectives are clear and measurable. Construction of several items (usually three to ten items) to validly measure each objective is the next step. Normally student mastery
Figure 7. The three-stage classroom measurement model (adapted from Kubiszyn & Borich, 1987, p. 33)

Test items must validly measure the instructional objectives.

is defined as 70, 80, or 90 percent correct response rate (Kubiszyn & Borich, 1987). Although the instructional activities will vary, depending on the content and type of learning outcomes desired, they should be based on precisely defined objectives if the criterion-referenced test is to be valid.

Manatt (1990) and Bloom et al. (1981) believed that validity and reliability are critical to all tests. For classroom tests, content validity is appropriate. Content validity and reliability are terms that refer to whether the test measures what it purports to measure in a particular class situation, and whether the test can be expected to produce consistent results. The former is called content validity, which
"...refers to the correspondence between achievement test items and instruction" (Bloom, 1981, p. 73). The later refers to reliability over time. Validity encompasses reliability; "a test cannot be useful in assessing student knowledge unless it can be depended upon to produce consistent results (Manatt, 1990, p. 1). To use his example:

...a reliable test, like a watch that loses five minutes an hour, although consistent, may not necessarily provide appropriate information. For example, an examination designed to measure English grammar given to a 20th Century English literature class would probably be very reliable; it would result in consistent scores for the students in the class. However, it would not be valid because the scores would not provide appropriate information regarding student knowledge of the course subject matter--20th Century English literature. Meaningful inferences about student achievement can only be drawn from scores of tests that are both appropriate and dependable--that is, content valid and reliable. (pp. 1-2)

The three stages involved in classroom measurement must include: 1) constructing instructional objectives, 2) implementing instructional activities that derive from these objectives, and 3) testing to measure the attainment of the instructional objectives if valid inferences are to be made regarding student performance (Kubiszyn & Borich, 1987).

**Taxonomy**

Objectives and test items may be written at different levels of complexity. For example, the objective, "the student will recite the multiplication tables with 95 percent accuracy," is knowledge based and requires lower order thinking skills. On the other hand, an objective such as "the student will defend the Civil War in terms of the Southern States' economic interests" requires a great deal more understanding and analysis of the issues of that period of history. This objective would
involve higher level thinking skills than reciting the multiplication tables.

A method for categorizing objectives according to their level of complexity was developed in 1956 by Bloom, Engelhart, Furst, Hill, and Kratwohl. They developed a taxonomy for educational objectives in the cognitive domain. The taxonomy delineates six levels of difficulty from knowledge, which is the lowest level of complexity, to evaluation, the most complex thought process. Table 3 illustrates the six levels of taxonomy\(^2\), their hierarchical order from low complexity to high, and their expected behavioral outcomes. Table 4 presents sample action verbs and objectives that reflect taxonomy levels.

Krathwohl, Bloom, and Masia (1964) envisioned several major values arising from the attempt to order these desired behavioral outcomes:

1. Clarifying educational objectives would help members of a group clarify and tighten the "language of educational objectives." ...all too frequently educational objectives are stated as meaningless platitudes and clichés. If educational objectives are to give direction to the learning process and to determine the nature of the evidence to be used in appraising the effects of the learning process, the terminology must become clear and meaningful.

2. To provide a convenient system for describing and ordering test items, examination techniques, and evaluation instruments.

3. To relate the results found in one educational situation to the results discovered in another. ...secure from the classification scheme was that of comparing and studying educational programs. (pp. 4-5)

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\(^2\)Although the taxonomy was theorized and developed by Bloom et al., the taxonomy is commonly referred to as "Bloom’s Taxonomy."
Table 3. Bloom's taxonomy of educational objectives (adapted from Bloom, Englehart, Furst, Hill, & Krathwohl, 1956, pp. 201-207)

<table>
<thead>
<tr>
<th>Ascending order of cognitive complexity</th>
<th>Expected outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation</td>
<td>Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria</td>
</tr>
<tr>
<td>Synthesis</td>
<td>The putting together of elements and parts so as to form a whole in such a way as to constitute a pattern or structure not clearly there before</td>
</tr>
<tr>
<td>Analysis</td>
<td>Identification of elements, recognition of relationships, ability to recognize form and pattern</td>
</tr>
<tr>
<td>Application</td>
<td>The use of abstractions in particular and concrete situations</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Can make use of material or ideas being communicated without necessarily relating it to other material or seeing its fullest implications</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Recall of specific facts, terminology, methodology, theories, structures</td>
</tr>
</tbody>
</table>

Krathwohl, Bloom, and Masia (1964) continue by stating that:

We believe that objectives of education might gain meaning through two rather distinct processes. One process is defining objectives in behavioral terms and then determining the evidence (i.e., tasks, tests, observations, etc.) which is relevant in judging whether students have or have not "achieved" the objective. A second process is that of trying to place an objective within a large overall scheme or matrix. It is the second process to which the classifications in the proposed taxonomy were addressed. (p. 4)

This taxonomy has been used by the School Improvement Model (SIM), teachers, curriculum developers, and educational researchers as one way to
Table 4. Levels of taxonomy, in hierarchical order, with examples of action verbs and sample objectives (adapted from Kubiszyn & Borich, 1987, pp. 55-56)

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Synthesis</th>
<th>Analysis</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>appraise</td>
<td>categorize</td>
<td>break down</td>
<td>change</td>
</tr>
<tr>
<td>compare</td>
<td>compile</td>
<td>deduce</td>
<td>compute</td>
</tr>
<tr>
<td>contrast</td>
<td>compose</td>
<td>diagram</td>
<td>demonstrate</td>
</tr>
<tr>
<td>conclude</td>
<td>create</td>
<td>differentiate</td>
<td>develop</td>
</tr>
<tr>
<td>criticize</td>
<td>design</td>
<td>distinguish</td>
<td>employ</td>
</tr>
<tr>
<td>defend</td>
<td>devise</td>
<td>point out</td>
<td>join</td>
</tr>
<tr>
<td>justify</td>
<td>formulate</td>
<td>relate</td>
<td>modify</td>
</tr>
<tr>
<td>interpret</td>
<td>rewrite</td>
<td>subdivide</td>
<td>operate</td>
</tr>
<tr>
<td>support</td>
<td>summarize</td>
<td></td>
<td>relate</td>
</tr>
<tr>
<td>validate</td>
<td></td>
<td></td>
<td>relate</td>
</tr>
</tbody>
</table>

Sample objectives:
- Given a previously unread paragraph, the student will judge its value according to the five criteria discussed in class.
- Given a description of a country's system, the student will defend it, basing arguments on principles of socialism.

- Given a short story, the student will write a different but plausible ending.
- Given a problem to be solved, the student will design on paper a scientific experiment to address the problem.

- Given a presidential speech, the student will point out the positions that attack an individual rather than his or her program.
- Given absurd statements, the student will point out the contradiction.

- On Monday, they will tell the class what he or she did over the holiday.
- Given fractions not covered in class, the student will multiply them with 85% accuracy.
Table 4. Continued

<table>
<thead>
<tr>
<th>Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>convert</td>
</tr>
<tr>
<td>explain</td>
</tr>
<tr>
<td>paraphrase</td>
</tr>
</tbody>
</table>

Sample objectives:
- By the end of the semester, the student will summarize the main events of a story in grammatically correct English.
- The student will discriminate between the "realist" and the "naturalist," citing examples from the reading.

<table>
<thead>
<tr>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>define</td>
</tr>
<tr>
<td>name</td>
</tr>
</tbody>
</table>

Sample objectives:
- Given the four major food groups, the student will recall the four major food groups without error.
- From memory, the student will match each United States general with his most famous battle.
alleviate the problem of specifying, in detail, the expected outcomes of the learning process. When educational objectives are stated in operational and detailed terms, it is possible to make appropriate evaluation instruments and to determine, with a great deal of certainty, which learning experiences are likely to be of value in promoting the development of an objective (Krathwohl, Bloom, & Masia, 1964, pp. 9-10).

Formative and summative tests

The main purpose of formative evaluations is to determine the extent of mastery of a learning task and to determine what has not yet been learned. Bloom (1971) said it best when he stated that "The purpose is not to grade or certify the learner; it is to help both the learner and the teacher focus upon the particular learning necessary for movement toward mastery" (p. 61). The focus of formative evaluation is to determine what is missing in the student's knowledge, skills, and abilities.

Summative evaluation, on the other hand, takes place at the end of a period of instruction in order to grade or certify students on a course of study or judge the effectiveness of a program of instruction or curriculum (Tyler, 1950; Bloom, Madaus, & Hastings, 1981). Ralph Tyler (1950), in his book Basic Principles of Curriculum and Instruction, did much to clarify the function of the summative test. Evaluation is seen as primarily a function to determine the extent to which students have or have not changed in relation to the set of desired behaviors or
objectives. They believe that clear statements of objectives serve as the primary step in the development and improvement of curriculum materials and instructional techniques (Tyler, 1950; Tyler, Gagné, & Scriven, 1967). These statements also serve as a direction for developing both formative and summative tests. When used for diagnostic evaluation for placement before instruction starts, the decision often depends on the results of a summative evaluation or relies on instruments designed for summative purposes. Generally, summative evaluation is targeted toward a general assessment of the degree to which the greater outcomes have been achieved of the entire course (Bloom, Hastings, & Madaus, 1971).

Since diagnosis takes place prior to instruction and is based on the student's achievement in comparison to some level of learning, diagnostic tests are quite different from formative tests (which provide the student and teacher with frequent feedback information as the learner moves through a unit of learning). Where diagnostic tests measure generalized skills or behaviors, formative tests are designed for a specific unit of instruction and to determine where in the unit the student is experiencing difficulty. While total scores are the goal of diagnostic evaluations, formative measures rely on item response patterns in terms of mastery or non-mastery for their validity as criterion-referenced measures (Bloom et al., 1971).

The level of generalization is the factor that differentiates summative from formative evaluation most sharply (Bloom, 1981, p. 62). Summative evaluations are not equally applicable to all grade levels or subject areas. The most common uses of these test results are the
following: 1) assigning of grades, 2) prediction of success in subsequent courses, 3) initiation point of instruction in a subsequent course, 4) feedback to students, and 5) comparisons of outcomes of different groups. Formative tests are achievement tests over specific units of learning. Summative tests are achievement tests over several units of learning (Bloom, 1971, p. 137). Table 5 illustrates the differences and similarities between diagnostic, formative, and summative evaluations.

There is agreement on assessment perquisites among theorists on four points:

1. The goal of instruction is to help students to change their behavior (i.e., the students must be able to do something after instruction that they could not do before).

2. The degree of success of a program or a course of study must be evaluated.

3. Objectives must be described in terms of observable actions or products.

4. Consider both formative and summative evaluation important but differ on the degree of emphasis.

Frequent feedback accompanied by specific help in instruction and material needed can decrease the time (and perseverance) required to learn a given task (Bloom, 1981, p. 58). In his article Time and Learning, Bloom believed that by using frequent feedback "...it is likely that most students will need less time to master a subject, and the ratio of time required by the slower learners to that needed by the faster learners may be reduced from about 6 to 1 to less than 2 to 1" (p. 685). Cone (1990),
Table 5. Similarities and differences between diagnostic, formative, and summative evaluation
(adapted from Bloom et al., 1971, pp. 91-92)

<table>
<thead>
<tr>
<th>Type of evaluation</th>
<th>Diagnostic</th>
<th>Formative</th>
<th>Summative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>Placement: Determine the presence or absence of prerequisite skills.</td>
<td>Feedback to student and teacher on student progress through unit.</td>
<td>Certification or grading of students at the end of a unit, semester, or course.</td>
</tr>
<tr>
<td></td>
<td>Determine the student's prior level of mastery.</td>
<td>Location of errors in terms of the structure of a unit so that remedial alternative instruction techniques can be prescribed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Classify the student according to various characteristics known or thought to be related to alternative modes of instruction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determine underlying causes of repeated learning difficulties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>For placement at the outset of a unit, semester, or year's work.</td>
<td>During instruction.</td>
<td>At the end of a unit, semester, or year's work.</td>
</tr>
<tr>
<td></td>
<td>During instruction when student evidence repeated inability to profit fully from ordinary instruction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical, psychological, and environmental factors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of evaluation</td>
<td>Diagnostic</td>
<td>Formative</td>
<td>Summative</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Type of instrumentation</td>
<td>Formative and summative instruments for pretests.</td>
<td>Specially designed formative instruments.</td>
<td>Final of summative examinations.</td>
</tr>
<tr>
<td></td>
<td>Standardized achievement tests.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standardized diagnostic tests.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Teacher-made instruments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Observation and checklists.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How objectives of</td>
<td>Specific sample of each prerequisite entry behavior.</td>
<td>Specific sample of all related tasks in the hierarchy of the unit.</td>
<td>A sample of weighted course objectives.</td>
</tr>
<tr>
<td>evaluation are sampled</td>
<td>Sample of weighted course objectives.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sample of student variables hypothesized or known to be related to a particular type of instruction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item difficulty</td>
<td>Diagnosis of prerequisite skills and abilities: a large number of easy items, 65% difficulty or higher.</td>
<td>Cannot be specified beforehand.</td>
<td>Average difficulty, ranging from 35 to 70%, with some very easy and some very difficult items.</td>
</tr>
<tr>
<td>Type of evaluation</td>
<td>Diagnostic</td>
<td>Formative</td>
<td>Summative</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Scoring</td>
<td>Norm- and criterion-referenced.</td>
<td>Criterion-referenced.</td>
<td>Generally norm-referenced but can be criterion-referenced.</td>
</tr>
<tr>
<td>Method of reporting scores</td>
<td>Individual profile by subskills.</td>
<td>Individual pattern of pass-fail scores on each task in the hierarchy.</td>
<td>Total score or subscores by objectives.</td>
</tr>
</tbody>
</table>
in his study of 174 college students, found that "...regular and frequent testing is associated with better achievement..." (p. 397). He concluded by stating:

This scheme extends the recommendation of Bloom, Hastings, and Madaus (1971) regarding formative and summative evaluation. For them, formative evaluation is intended to provide both students and instructors with feedback en route to the summative evaluation that "counts" on the grade. In our scheme the Unit Mastery Quizzes serve a double purpose: for students who master the material daily, the quizzes serve a summative evaluation and they are rewarded for mastery with free absence from class; for the students who do not demonstrate daily mastery, the quizzes serve as a formative evaluation prior to the [Unit]-completion Tests. (p. 398).

The Manatt and Holzman study (1991) of Hot Springs School District No. 1 supports the findings of previous researchers in favor of formative criterion-referenced measures methodology. The five-year study included grades K-12 and the subjects of reading, English, mathematics, social studies, and science. The district designed criterion-referenced tests around a revised curriculum. They found that elementary school achievement on the norm-referenced test increased from 61 percentile to 81 percentile, a 20 point gain. Middle school achievement had an 11 point (59-70) gain during the same period, and high school had an 8 percentile point gain (59-67). The overall district composite rose by 14 percentile points to 73 percentile (p. 24). The authors reasoned that the gains in the study resulted from everyone having more usable information, not just more information (p. 24). The measurement instrument used was Science Research Associates Student Achievement Tests.

In the summer of 1984, Fuchs, Deno, and Mirkin published an article on the repeated effects of curriculum based measurement and evaluation.
Thirty-nine special educators, each having three to four students, were randomly assigned to one of two groups: 1) a segmented curriculum based measurement group (experimental), or 2) a conventional special education evaluation treatment group (control). Reading achievement was tested before and after the 18-week study. Fuchs et al. discovered that experimental teachers "effected greater student achievement" and that 1) their decisions reflected more accurate assessment of student progress, 2) their instructional behavior demonstrated greater increases in student learning time, and 3) the students were more aware of the instructional goals and their own progress (pp. 456-458).

Summary

Certain kinds of test data help the evaluator to determine a student's place or rank. This is accomplished by comparing the student's performance to a norm or average of performances by other, similar students. A test that yields this kind of information is called a norm-referenced test (NRT), since the information it conveys refers back to the performance of a large sample of students representative of the one being tested (Kubiszyn & Borich, 1987). This information is useful only for certain types of decisions.

A second type of test provides information regarding a student's level of proficiency in or mastery of some skill or set of skills. This is achieved by comparing a student's performance to a standard or mastery level called a criterion. A test that yields this kind of information is called a criterion-referenced test (CRT), since the information it provides refers to a comparison with a criterion or absolute standard.
This information is useful in deciding whether a student needs more or less instruction in some identified skill or set of skills. This type of information is also useful for only certain types of educational decisions.

It is important to identify the type of specific information desired before administering a test; failing to do so will provide test information not useful for the desired decision. Unfortunately, teachers frequently know little more about a student after testing than they did before. In our technically oriented society, test scores have become "ends in themselves giving the illusion that the scores themselves are what is important" (Kubiszyn & Borich, 1987, p. 24). The judgment criteria by which test scores must be interpreted and made meaningful for decision making determines if a criterion-referenced or a norm-referenced test will be used.

Selected Software Review

One of the major responsibilities of teachers is to evaluate students to determine if they have mastered the material presented in classroom instruction. Teachers have traditionally accomplished this task by writing their own tests without regard for test item validity or reliability. They find the task time consuming and simply make up one or two forms of a test and continue to use them year after year. Teachers may acknowledge that a certain question is "a bad item" but leave it on the test because retyping the entire test is too much trouble (Vocknell & Hall, 1989). Researchers have shown that when teachers measure student
achievement with curriculum based measurement and use the information to develop and revise instructional plans, both instructional quality and student achievement improve (Fuchs, Deno, & Mirkin, 1984; Fuchs, Fuchs, Hamlett, & Stecker, 1991).

Most computer based instructional management programs are outgrowths of older, larger computer systems. They were designed for use by computer specialists and not very "user friendly" (Shore & Daniel, 1992). The microcomputer offers unlimited possibilities for both students and teachers, as well as "an expectation that it will transform many aspects of education--the content and body of knowledge taught, the way education is delivered, and the types of facilities required to support that delivery" (Hathaway, 1989, p. 23).

Hathaway sees a well-designed management system facilitating a number of important educational activities:

It should organize the curriculum, enable the delivery of instruction in a variety of modes, monitor student progress, direct teachers and students to lessons and materials, diagnose and prescribe learning objectives, assess student outcomes, evaluate the curriculum, select test items from test banks, manage learning resources, and provide educational and curriculum planning information for educational managers at the classroom, school, district and provincial or state levels. (p. 23)

He continues by specifying that such a management system should be able to:

1. Provide more user-friendliness than the existing educational systems currently in use.
2. Accommodate group instructional processes as well as individualization, customized learning and continuous progress [i.e., the system should facilitate prescription and monitoring of mastery learning].
3. Provide for systematic curriculum evaluation and modification [i.e., facilitate curriculum revision]
4. Integrate productive teacher activities into a comprehensive curriculum development, delivery, evaluation, and revision system.
5. Reflect a number of theories of child development and cognition, and to manage a wide assortment of learning resources designed to support these different learning theories and approaches.
6. Provide for managing individualized programs [i.e., record keeping and program planning ability].
7. Foster student progress based on performance. (p. 23)

At the present time, the microcomputer has not come close to realizing its potential in helping educators manage a school curriculum and the formative and summative evaluations that need to go with it.

Commercially available software

"The Guide to Computer Hardware, Software, and Communications Products and Companies--the Entire Marketplace" by Ziff Communications Company was an invaluable resource for this review. The guide provides both products and company information and is organized into two volumes:

1. Volume 1: Hardware, data communications products, and services;

Each volume is further divided into lettered tab sections and subsections covering specific applications (i.e., accounting, engineering, education, etc.). Each of the 27 companies listed under education was contacted for additional information and to request sample products for personal examination. Software application found to be inappropriate, or companies that were unable to provide working samples, were not included in this review. Personal interviews with curriculum directors or technology
directors, as appropriate, were solicited for information regarding computer management systems used in the school district. Table 6 provides a brief overview of the software reviewed.

A more detailed description of educational software useful in making tests and managing subsequent performance information follows. Although exact cost estimations and specific computer configuration requirements are available, they are not listed here. Generally, costs for software range from $699 for a simple test generator to $40,000 for a complete management system with support services.

**Apple Macintosh compatible only**

1. CEO Software Solutions

   **Computerized Instructional Management Systems (CIMS):** CIMS analyzes standardized and criterion-referenced tests and correlates curriculum to tested skills. It generates individual instructional plans for students, group lesson plans, and class status information. This package is a tool that guides decision making for resource allocation, instructional programming, and school based planning. NOTE: Also available for use with Windows 3.X.

2. Logic Extensions Resources

   **LXR Test (V 4.1):** This software allows teachers to generate many types of tests. It can handle graphics, complicated equations, and can either generate randomized tests from a pool of questions or simply randomize question order. Questions and answers are first entered using the desired format (multiple choice or free form). The correct answer may
Table 6. Summary of software review

<table>
<thead>
<tr>
<th>Company</th>
<th>Software name</th>
<th>Apple Macintosh compatible</th>
<th>IBM compatible</th>
<th>Management system</th>
<th>Test generator included/only</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCS/Assurance Co.</td>
<td>Project Assure</td>
<td>Yes</td>
<td>No</td>
<td>Included</td>
<td></td>
</tr>
<tr>
<td>Abacus Educational Systems</td>
<td>Abacus Instructional Management Systems (AIMS)</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Included</td>
</tr>
<tr>
<td>CEO Software Solutions</td>
<td>Computerized Instructional Management Systems (CIMS)</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Included</td>
</tr>
<tr>
<td>Chariot Software Group</td>
<td>Micro Test III</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Only</td>
</tr>
<tr>
<td>Compu-Tations, Inc.</td>
<td>Tests Made Easy</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Only</td>
</tr>
<tr>
<td>Cross Educational Software, Inc.</td>
<td>Create-A-Test</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Only</td>
</tr>
<tr>
<td>Educational Clearinghouse, Inc.</td>
<td>Test Construction and Review</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Only</td>
</tr>
<tr>
<td>Logic Extensions Resources</td>
<td>Computerized Instructional Management Systems (LXR Test, V 4.1)</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Included</td>
</tr>
<tr>
<td>Company</td>
<td>Software name</td>
<td>Apple Macintosh compatible</td>
<td>IBM compatible</td>
<td>Management system</td>
<td>Test generator included/only</td>
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<td>---------------------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>National Computer Systems, Inc.</td>
<td>Instructional Management System Plus (IMS Plus)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Included</td>
</tr>
<tr>
<td></td>
<td>Performance Plus (updated version of IMS Plus)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Only</td>
</tr>
<tr>
<td>Tutorial Systems</td>
<td>Student Instruction Management System (SIMS)</td>
<td>Yes</td>
<td>Yes</td>
<td>Included</td>
<td></td>
</tr>
<tr>
<td>Wicat Systems, Inc.</td>
<td>Open Architecture Learning System</td>
<td>Yes</td>
<td>Yes</td>
<td>Included</td>
<td></td>
</tr>
</tbody>
</table>
be entered in the box provided on screen or indicated by "clicking" the answer with the mouse. Using desktop publishing techniques, LXR Test can print out tests, response forms, and scoring keys. A test with the correct answers can also be printed for review. Record keeping on each question can include key words for easy searching and references from the text or other sources. If the scoring edition of the program is used, students' answers may be recorded and compiled electronically. Test answers can be scanned using a Scantron or Chatsworth scanner, or entered manually. Test results can be compiled for the class and then reported in a table format or graphically. The software tracks statistical and prescriptive information on each student and works as a word processing and data based management system (DBMS). When reporting student mastery, the choices are mastery or non-mastery since it records in only two foils. The program manual is easy to use for the beginning user.


MakeTest: MakeTest allows teachers to create their own question files and use those files to generate tests containing multiple choice, true/false, fill-in, and essay questions. Any number of question files covering any topic, including math and science, which may require symbols, may be created. Tests are created using the Test Editor window, a scrolling window that displays a list of all of the questions available in an open test file. A second window displays the order of the selected questions. Questions may be chosen manually, or tests may be created automatically by specifying the topic and the number of questions to be randomly selected by type and level of difficulty. Questions may contain
either text or graphics, and text passages may mix fonts, sizes, and styles. It is possible to have more than one question file open at once and to build tests by selecting questions from several different question files. The answer field is automatically formatted to the type of question selected, and the amount of work space reserved for each question may be specified. A Browse window displays a table that shows the number, types, levels of difficulty, and topics for all questions in a file. Lines of text may be added to tests for headings or special instructions. A Scramble function allows for changing the order of test questions. A Test Summary feature details the distribution of question types and levels of difficulty for an entire test or any topic within a test. Printing an answer key is also possible.

**International Business Machines (IBM) compatible only**

1. NCS/Assurance Company

The Assurance Company (recently purchased by National Computer Systems) is located in Tucson, Arizona and publishes the test generator and test item bank Project Assure™. Currently there are three programs, Assure I, II, and an upgrade Assure III. Assure I is the software used to access the 36,000 question item bank, while Assure II scores tests (group test statistics, item analysis, P coefficients, KR-20 reliability, and item discrimination), generates reports, and manages the test items. Assure III provides cumulative records of both individual and group test performance.
The test item bank covers the K-12 subjects of mathematics (through calculus), language arts, social studies, science, health, and life survival skills (filling out a job application, banking, tax preparation, etc.). When Dr. Peterson chose Project Assure five or six years ago, he stated "that there was not much out there at the time so we went with what was available." Before purchasing Project Assure, he looked at the Quantum Series and the North West Item Bank from Washington State. After the Area Education Agency (AEA) purchased the item bank, they redid all of the test booklets and "corrected all of the wrong answers." Based on his experience, Peterson sees the program as "60 percent good and 40 percent needs a lot of reworking." Most of the questions in the item bank are "lower order thinking skills and there are no graphs to challenge thinking." He finds the program useful in "categorizing information and it is easy to align to the curriculum but the teachers don't find it user friendly. The 23 reports that the system can generate is great." "There are gaps in the program. It does not cover new topics so we must add them in with the new code." "By the way, Assure III won't be compatible with previous additions." (Note: It appeared that Dr. Peterson was not

3 Telephone interview with Dr. Dick Peterson, Director of Educational Services, Western Hills Area Education Agency, January 27, 1994.

4 Iowa has 15 Area Education Agencies (AEA). The AEAs function as the intermediate units between the Department of Education, school districts, and local schools. Each AEA is made up of three divisions: Special Education, which provides support and comprehensive individual program reviews for those serviced in the program; Media Services, which makes available videos, films, print materials, and a professional library to teachers; and Educational Services, which covers the instructional area of education along with providing inservice and continuing education for both teachers and administrators. Western Hills AEA provides services to 27 school districts.
completely pleased with either Program Assure™ or with the support the AEA has received from the company over the years.)

2. Abacus Educational Systems

**Abacus Instructional Management System (AIMS):** Abacus features an "open architecture" design. Schools can input their own objectives, test item banks, and instructional resources, or they can give that information to Abacus and the company will pre-program the software. AIMS also has objectives that are pre-defined statements of goals at which instruction is to be targeted. The program provides interactive terminal functions for storing and retrieving descriptive information for the objectives. It is also capable of relating different objectives that are similar in instructional content but found in different subjects and grade levels. AIMS permits the storage and retrieval of information on available instructional resources such as books, films, videotapes, etc. A detailed description (e.g., chapters, page numbers, etc.) can be entered for each resource, as well as locations where the resource resides. An instructor can specify a particular objective and be supplied with a list of all instructional materials available in the district that may be useful in teaching that objective.

The test item bank stores items that can be selected when creating a test. The answer codes for test items can be entered to enable the system to score true/false, multiple choice, and matching type questions. Comments and diagnostic messages can be associated with each incorrect response to indicate possible problems or misunderstandings in students' comprehension of the tested material. AIMS can create two types of tests.
AIMS tests and instructor tests are constructed from items in the item bank for specific objectives. This test can be printed, along with an answer sheet and any test instructions. Instructor tests are defined by the instructor, based on an already existing test. Only the answer sheet can be printed for this type of test. AIMS accumulates information on each student's mastering assigned objectives.

Various options are provided to report student information, including current mastery progress and any historical mastery data from previous school years. This software has the capability to select the following user-defined reports: 1) objectives and correlated objectives, 2) instructional resources, 3) test items, and 4) student, class, school, and mastery analysis and summaries. This company provides excellent support with such services as pre-programming and installation so that it comes ready to run (Terian, 1989).

3. International Business Machines (IBM)

    Instructional Support System (ISS): The learning objectives are the core of this management system. Test items, learning activities, mastery analysis, and prescriptions are all tied to the objectives. This software package is highly rated in the January 1989 issue of Technological Horizons in Education.


    Instructional Management System Plus (IMS Plus): This software package is comprised of four integrated modules: student records both demographic and test data, criterion-referenced test processing, test generation, and prescriptions. It accommodates curriculum from test
publishers and locally developed curriculum. The available reports include student profile of mastery, grouping by mastery level, summary of group mastery, parent report, and item analysis. It is reported as not being very user friendly.

**Microtest Score II:** This program scores teacher-made, criterion-referenced, and multiple-choice tests. It scans objective tests with multiple subtests, merges data files, and prints reports. Report options include individual test results, individual item response, frequency distribution, test score distribution, and item analysis report.

**Performance Plus:** This software has the ability to organize, store, and maintain curriculum data on student outcomes, assessment instruments, diagnostic statements, and instructional resources. It is also capable of tracking student performance on outcomes and has extensive reporting possibilities. These include individual reports (student profiles, history, and test records), group reports (student and group profiles), summary reports (class, class test matrix, course, and grade level), diagnostic/prescriptive reporting (individual education programs), and demographic data. Assessment data can be disaggregated based on student demographics.

5. Tutorial Systems

**Student Instruction Management System (SIMS):** This is a comprehensive software system that enables schools to maintain and utilize test item banks to generate and present customized tests interactively to students at all grade levels. Integrates instruction management components such as tests, student administrative data, instructional
requirements such as essential skills, strategies or mastery levels, reporting requirements and statistical analysis (test summary statistics and item analysis).


**Wicat Open Architecture Learning System:** Wicat provides comprehensive instruction and testing for K-12 schools. Programs include Mainstream, Chapter I, GED, At-Risk, and ESL/LEP. Students' learning deficiencies are diagnosed and prescriptions for remediations are done automatically through Wicat's Learning Management System. It can integrate with any curriculum assisted instruction (CAI) software.

**Both Apple and IBM compatible**

1. Chariot Software Group

**Micro Test III:** Micro Test III generates multiple test versions, stores test materials in question format on diskettes, and can update and expand test item files. It has graphics capabilities also.

2. Compu-Tations, Inc.

**Tests Made Easy:** This software application allows the teacher to enter, store, review and delete questions, and select specific questions from a previously created file or have the computer generate a test. It permits 300 essay or fill-in questions per file with each question and answer capable of handling 600 characters.


**Create-A-Test:** The user selects questions from an item bank and then prints in a formatted test. It includes text editor for typing new
questions. Question files can be purchased separately or written by the user. Forty-seven question diskettes hold 400-450 questions each.

4. Educational Clearinghouse, Inc.

Test Construction and Review: This software combines tests in any subject area with multiple choice or true/false items. The program stores, files, and retrieves tests or quizzes from diskettes.

School Improvement Model (SIM)

The framework used for developing the curriculum utilizes seven steps in developing: 1) a philosophy statement (subject area), 2) strands of learning, 3) program goals, 4) scope and sequence, 5) instructional objectives, 6) criterion-referenced measures, 7) instructional activities (teachers' and students'), and 8) instructional tools (Manatt, 1993a, p. 35). A critical component to this framework is the process of curriculum alignment, "i.e., the congruent relationship between the written, the taught, and the tested curriculum" (pp. 34-35). This component focuses on renewing or defining the curriculum. The first step is determining what changes need to be made and then choosing the curricular area on which to focus. Thus the framework is completed and the content is organized. The result of this process is a curriculum guide that is used for making decisions about what is to be taught, at which grade level, and to what extent the learning should occur (p. 25).

Next in the SIM process, the emphasis is on writing or selecting assessments (criterion-referenced) so they are an integral part of what is taught. These measures are designed to determine if a student has
achieved mastery of the learner outcomes which have been taught. Table 7 illustrates the curriculum development process.

Summary

Since the six national goals for education were announced in 1990 by then President Bush and the 50 state governors at the conclusion of the Governors Conference on Education, there has been wide acceptance of their merit but skepticism that they can be achieved by the year 2000, only six years from now. Elam, Rose, and Gallup (1993) state "that every goal but one was given either a 'very high' or 'high' priority by more than 80 percent of the respondents" (p. 140). For the current Phi Delta Kappa Gallup Poll, the authors asked the public: "How high a priority do you think each goal should have for the remainder of the decade--very high, high, low, or very low?" (p. 140). Elam et al., in explaining their sampling techniques, believed the procedures produced a large enough sample to ensure that the findings reported were statistically significant. Table 8 is an illustration of the results of the latest poll taken and followed by a brief goal statement.

There is a widespread belief that schools can no longer remain the same if the children they educate are to be successful in the next millennium. Educators must examine basic philosophical beliefs about teaching, learning, the nature of students, and the kinds of environments that maximize growth for both teachers and students. A great need exists to sort out personal values, develop new belief systems, and ultimately create schools that educate as well as train, schools that foster learning
Table 7. The curriculum development process (adapted from the Hanford Elementary School District proposal, 1993, p. 13)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Questions/topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Conduct an assessment of the curriculum.</td>
<td>-What is being done now?</td>
</tr>
<tr>
<td>2. Identify the content area to be developed.</td>
<td>-Identify strengths and weaknesses.</td>
</tr>
<tr>
<td>3. Outline the content area issues to be considered.</td>
<td>-How frequently will the learning be needed?</td>
</tr>
<tr>
<td></td>
<td>-How far are students capable of extending any given learning?</td>
</tr>
<tr>
<td></td>
<td>-What learning experiences can be provided?</td>
</tr>
<tr>
<td></td>
<td>-What is the local development of content in this field?</td>
</tr>
<tr>
<td></td>
<td>-How much repetition in this area is justified?</td>
</tr>
<tr>
<td>4. Write the philosophical statements for the subject area.</td>
<td></td>
</tr>
<tr>
<td>5. Identify the strands within the subject area.</td>
<td></td>
</tr>
<tr>
<td>6. Write program goals for each strand.</td>
<td></td>
</tr>
<tr>
<td>7. Scope and sequence.</td>
<td>-Who is responsible for the introduction, development, mastery, and reinforcement of the skills/concepts understandings?</td>
</tr>
<tr>
<td>8. Organize the content as unit plans to include:</td>
<td></td>
</tr>
<tr>
<td>-learner outcomes.</td>
<td></td>
</tr>
<tr>
<td>-evaluation.</td>
<td></td>
</tr>
<tr>
<td>-instructional methods and procedures.</td>
<td></td>
</tr>
<tr>
<td>-student activities.</td>
<td></td>
</tr>
<tr>
<td>-instructional resources.</td>
<td></td>
</tr>
<tr>
<td>9. Custom fit the plan to the students and the situation through daily lesson plans.</td>
<td>-What are the individual rates/concepts?</td>
</tr>
<tr>
<td></td>
<td>-How much time is needed?</td>
</tr>
</tbody>
</table>
Table 8. The 25th annual Phi Delta Kappa Gallup Poll (adapted from Elam, Rose, & Gallup, 1993, p. 140)

<table>
<thead>
<tr>
<th>Prioritized national educational goals</th>
<th>Priority assigned</th>
<th>National totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very high</td>
<td>High</td>
</tr>
<tr>
<td>By the year 2000:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. all children in America will start school ready to learn.</td>
<td>41</td>
<td>48</td>
</tr>
<tr>
<td>2. the high school graduation rate will increase to at least 90%.</td>
<td>54</td>
<td>38</td>
</tr>
<tr>
<td>3. American students will leave grades 4, 8, and 12 having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography. In addition, every school will ensure that all students will learn to use their minds well so that they may be prepared for responsible citizenship, further learning, and productive employment in a modern economy.</td>
<td>59</td>
<td>33</td>
</tr>
<tr>
<td>4. American students will be first in the world in science and mathematics achievement.</td>
<td>45</td>
<td>43</td>
</tr>
</tbody>
</table>
### Table 8. Continued

<table>
<thead>
<tr>
<th>National educational goals</th>
<th>Priority assigned</th>
<th>National totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very high</td>
<td>High</td>
</tr>
<tr>
<td>5. every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and to exercise the rights and responsibilities of citizenship.</td>
<td>54</td>
<td>37</td>
</tr>
<tr>
<td>6. every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning.</td>
<td>71</td>
<td>19</td>
</tr>
</tbody>
</table>
in all ways that it can occur (Michaels, 1988). The literature reviewed clearly supports the potential for transforming the schools into places of continuous student growth and measurable achievement. The basic assumptions of all classrooms must be that all students can (and are expected to) learn if given enough time to master instructional material. The literature supports the need for better and more consistent assessment of student achievement. Table 9 is a summary of the review of the literature.

The technology is available to manage the large amounts of data generated by continuous monitoring of achievement. The microcomputer is the tool that can assist in the instructional decision-making process by managing the curriculum, the evaluative information, and provide the method for feedback to students, teachers, parents, and administrators.
Table 9. Synopsis of the review of the literature

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Global postulate(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gagné</td>
<td>1975</td>
<td>• The feedback phase is the conformation of the student expectation resulting in reinforcement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Introduced the concept of phases (hierarchy) that must be part of learning.</td>
</tr>
<tr>
<td>Carroll</td>
<td>1963</td>
<td>• Proposed that the degree of learning was a function of the time actually spent in direct learning activities divided by the time needed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The learner must be told, in words that he can understand, what he/she is to learn, and how he/she is to learn it.</td>
</tr>
<tr>
<td>Bloom et al.</td>
<td>1956</td>
<td>• Developed a method for categorizing objectives according to their level of complexity.</td>
</tr>
<tr>
<td>Bloom</td>
<td>1968</td>
<td>• The three assumptions of mastery learning:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) instruction is segmented into separate skills which are arranged hierarchically according to difficulty,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) teachers engage in teach/formative test/corrective activities/formative test instructional cycle, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3) students are given time needed to learn a skill before progressing to the next skill.</td>
</tr>
<tr>
<td>Bloom</td>
<td>1971</td>
<td>• Formative tests rely on item response patterns in terms of mastery or non-mastery for their validity as criterion-referenced measures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Formative tests provide students and teachers with feedback information as the learner moves through the unit.</td>
</tr>
</tbody>
</table>
### Table 9. Continued

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Global postulate(s)</th>
</tr>
</thead>
</table>
| Fuchs et al. | 1984, 1991 | • When using segmented curriculum-based measurement found that:  
1) teachers' decisions behavior demonstrated a greater increase in student learning time,  
2) their instructional behavior demonstrated a greater increase in student learning time,  
3) the students were more aware of the instructional goals and their own progress. |
| Hathaway     | 1989       | • The microcomputer will transform many aspects of education—the content and body of knowledge taught, the way education is delivered, and the type of facilities required to support that delivery. |
| SIM          | 1980-93    | • Seven-step framework for developing curriculum:  
1) a philosophy statement (subject area),  
2) strands of learning,  
3) program goals,  
4) scope and sequence  
5) instructional objectives,  
6) instructional activities, and  
7) all criterion-referenced tests have been piloted with at least 100 students.  
• Learner outcomes utilize Bloom's taxonomy.  
• Utilizes a learner sequence of introduce, expand, mastery, reinforce, maintain mastery. |
CHAPTER III. METHODOLOGY

The present investigation was conceived as an experiment to determine how to quickly and inexpensively bridge from Gilbert's curriculum with the requisite faculty buy-in (ownership) to the existing School Improvement Model (SIM) process and product (curriculum renewal, robust scope and sequence, and curriculum driven assessment).

Due to the nature of this study, the statement of the problem and the questions posed are not intended to generate hypotheses to be tested empirically. The intent is to: 1) provide a model of procedures for future use to facilitate the movement towards results based education, as the term relates to the development of skills, concepts, and mastery learning; 2) provide a rubric useful to nationwide practitioners in implementing those outcomes; and 3) provide an initiative for implementing mastery teaching and learning.

The following questions were used to define the problem of this study. Each was further delineated into sequential steps taken to answer the main questions.

1. What specifications for curriculum outcomes can be identified in the curriculum of a progressive small district which has given considerable effort to the planning process in the past three years?
   Steps:
   a. Fifth and sixth grade mathematics will be the curricular area for this study.
b. Review the current curriculum guides.

c. Answer the following questions regarding the curriculum guides (scope and sequence, behavioral objectives, and goals):

1) How many learner outcomes (behavioral objectives) are specified?

2) Are there strands (consistent themes)?

3) Are there strands (units)?

4) What test items, if any, have been written by the district for the learner outcomes?

5) How closely does the textbook parallel the learner outcomes?

2. How can the very complex and detailed SIM curriculum\(^1\) and its array of assessment items be properly connected to that district’s curriculum?

Steps:

a. Create a document to bridge the two curricula that would include a comparison of:

1) strands,

2) program goals,

3) learner outcomes, and

4) the National Council of Teachers of Mathematics (NCTM) Standards.

\(^1\)This is the SIM curriculum as embodied in the Florida project.
b. Devise a code to link learner outcomes to test items suitable for Performance Plus™, the platform selected by the district. The code number is required so that when a student cannot answer a question, both the student and the teacher are directed to the learner outcome for reteaching.

3. How can interval or segmented testing be built upon summative testing now a part of the School Improvement Model? In order to use mastery teaching techniques, the teacher must have a series of diagnostic tests, not simply the end-of-year test that Monroe County SIM provides.

Steps:

a. Develop a summative test to increase the pool of test items.

b. Conduct a standard item analysis to determine test validity and reliability.

c. Experiment with mastery teaching.

d. Use a reporting process such as Performance Plus™ as one of the tools in the mastery teaching sequence of test/teach/test/retake or enrich.

4. What are the primary steps in developing procedures for formative evaluation of students rather than pre/post summative testing?

Steps:

a. Identify the following units (the district uses units not strands, but they do have a proper learning sequence) in the following order:

1) addition and subtraction of whole numbers,
2) multiplication of whole numbers,
3) division of whole numbers,
4) addition and subtraction of decimals,
5) multiplication and division of decimals, and
6) measurement (customary).

b. Determine the time needed to teach the material in a unit.
c. Develop enrichment activities.

5. Do different levels of teacher participation impact the acceptance of any model developed?

Steps:

a. Conduct a survey of both teachers familiar and unfamiliar with the use of the SIM enriched curriculum and the computer management system.
b. Analyze the results to determine if different levels of acceptance exist.
c. Secure approval from Human Subjects Committee, Iowa State University. (Approval was granted.)

6. What specifications, with and without summative measures, are appropriate for formative testing?

Steps:

a. Summative test standards:

1) Develop properly written learner outcomes.
2) Develop a 100-item test.
3) Target coefficient of reliability (KR-20) of 75 as the minimum acceptable.
b. Formative test standards:

1) No item should be used unless it has been pilot tested using the standard item analysis, so the reliability and discrimination index are known.

2) Test items need to be hooked, by code numbers, to specific learner outcomes.

3) Some test items need to be at the application, analysis, synthesis, and evaluation levels on Bloom's taxonomy (above knowledge and comprehension).

7. If teachers, students, parents, and administrators are going to be accountable for student achievement, how is information regarding progress going to be provided to parents and students?

Steps:

a. Use the summative and formative reports from Performance Plus™.

b. Use the following reports: individual student report, parent report, class item response report, and student response diagnostics.

8. How can a computer management system facilitate the entire process of curriculum renewal and curriculum driven assessment?

Steps:

a. Examine the capabilities of Performance Plus™.

b. Determine the time needed to fully implement the system, knowing there are shortcomings (art work, etc.) of this particular platform.
This study utilizes both case study and feasibility methodology. The case study has a relatively long history in sociology and the study of individual differences. In psychology, a case study requires the collection of very extensive data in order to produce an in-depth understanding of what is being studied. Although less extensively used in education, it has become a popular method for collecting qualitative data due to the complexity of the school environment. Case studies frequently utilize both qualitative and quantitative methodology over a period of time (Borg & Gall, 1989).

A brief literature review of qualitative research methodology follows. Although qualitative and quantitative methods have different design theories, both are rigorous and systematic approaches in explaining phenomena. Bogdan and Biklen (1982) referred to qualitative research as "multiple realities" of how something is experienced and perceived by other people (p. 46).

Review of Qualitative Research Theory

The 1960s brought national focus to educational problems, revived interest in qualitative research, and reintroduced educational researchers to the qualitative approach (Bogdan & Biklen, 1982). The authors noted that:

Qualitative research methods represented the kind of democratic impetus on the rise during the sixties. The climate of the times renewed interest in qualitative methods, created a need for more experienced mentors of this research approach, and opened the way for methodological growth and development. (p. 20)
The term *ethnography* implies the traditional participant-observer approach of many anthropologists and comes to mind when one hears the term *qualitative research*. Researchers use a number of techniques that do not necessarily fit this classic ethnographic mode. Vincent Rogers (1984), in his article *Qualitative Research: Another Way of Knowing*, gives several examples:

Carl Bernstein and Robert Woodward, the authors of *All The President's Men* (1974), employed qualitative research techniques as they sought data from "key informants" involved in the Watergate scandal. So were the investigative reporters who doubted the accuracy of official reports issued during the Vietnam War and so began to conduct intensive interviews with participants and to observe events on the front with their own eyes. The results of their work were also a form of qualitative research. The classic study of Jean Piaget in which children are interviewed is also an example of qualitative research that does not fit the classic, ethnographic mode. (pp. 93-94)

Bogdan and Biklen (1982) and Eisner (1991) believe that qualitative research usually include five characteristics:

1. **Qualitative research has the natural setting as the direct source of data and the researcher is the key instrument.** Researchers enter and spend considerable time in schools, families, neighborhoods, and other locales learning about educational concerns.

2. **Qualitative research is descriptive.** The data collected is in the form of words or pictures rather than numbers.

3. **Qualitative researchers are concerned with process rather than simply with outcomes or products.** Researchers are not putting together a puzzle, whose picture is already known. They are constructing a picture which takes shape as they collect and examine the parts.

4. **Qualitative researchers tend to analyze their data inductively.** They develop a grounded theory that emerges from the many disparate pieces of collected evidence that are interconnected.

5. **Meaning is of essential concern to the qualitative approach.** These researchers are concerned with what are called *participant perspectives*. (pp. 27-29)
Eisner (1991) further believes it is important to realize that not all qualitative research contains all five characteristics, but rather this method of research should be viewed as an issue of degree (p. 41).

Qualitative Research Methodology

Borg and Gall (1989) identify ten characteristics of qualitative research generally accepted by those who employ this methodology. A synopsis of the descriptions of these follows:

1. Research involves holistic inquiry carried out in a natural setting. Qualitative research is virtually always field research in which the investigator tries to study all elements present in the setting in which the inquiry takes place.

2. Humans are the primary data gathering instrument. Many researchers collect supplemental data with more objective instruments such as questionnaires and paper-and-pencil tests.

3. Purposeful rather than random sampling. By purposely selecting a wide range of subjects, the researcher will be more likely to uncover the full array of multiple realities relevant to the inquiry.

4. Inductive data analysis. Instead of focusing on testing a preconceived hypothesis, the emphasis is on gathering data first, then developing understanding from which generalizations can be drawn.

5. Development of grounded theory. Theory that is developed from the data is viewed as superior to a priori theory because it will more accurately reflect the data.

6. Design emerges as the research progresses. The investigator starts with a very tentative design (in some cases none at all) and develops the design as the investigation progresses. The rationale for emergent design is that it is impossible for enough to be known ahead of time to develop an adequate research design.

7. Subjects play a role in interpreting outcomes. The researcher attempts to reconstruct reality from the frame of reference of the subjects by asking for their perceptions.

8. Utilization of intuitive insights. Qualitative researchers place more emphasis on tacit or intuitive knowledge.
9. Emphasis on social process. Qualitative studies focus upon social process and meanings that participants attribute to social situations.

10. Emphasis on qualitative methods. Qualitative data gathering procedures are obviously preferred because they are considered more amenable to the diversity of multiple realities researchers find in a complex field situation. (pp. 385-387)

Disadvantages of Qualitative Research

Borg and Gall (1989) and Rogers (1984) cite several disadvantages to qualitative research methods:

1. Although a very alert and sophisticated observer can write clearly and rapidly, most observers need to be trained in observational techniques.
2. The necessity to spend many hours in observation makes the original research very costly and difficult to replicate by other researchers.
3. The observational records (field notes) tend to be very long and difficult to quantify and interpret.
4. Since the observations are subjective and checks of interrater reliability usually cannot be made, the observer's biases may seriously affect the findings.
5. It is virtually impossible to observe and write down all behavior as it occurs in a natural setting, therefore, the observer is forced to make instant decisions on what to write down and omit.
6. Since the observer often becomes an active participant in the environment being studied, this can lead to role conflicts and emotional involvement, which can reduce the validity of the data being collected. (pp. 390-391)

Description of the Study Site

The elementary unit of the Gilbert (Iowa) Community School District was selected for this experiment because of its culture and previous efforts at transformation. The culture includes a well-established building level team and shared decision making. Previous transformation efforts include staff development for all teachers and the Lezotte approach to effective schools provided by Dr. William Rauhauser (who was
previously trained by the School Improvement Model project at Iowa State University from 1981-1983). In addition, the district spent two years developing curriculum outcomes and standards.

Gilbert Elementary School has 23 classrooms with approximately 23 students in each for a total population of 372 students kindergarten through sixth grade. The total minority population is 17, with a white to minority student ratio of 20.8 to 1. There are 23 teachers with six support staff and one principal. Approximately 51 students, or 14 percent, of the student body obtain free or reduced priced lunches. The district allocates $4480 to educate each child in the district.

The Iowa Test of Basic Skills, Form G, given in 1992, included assessment of skills in language, reading, work study, mathematics, science, and social studies. Aggregate composite scores (Iowa norms) ranged from the 27th percentile for second graders to the 75th percentile for sixth graders. Table 10 illustrates data regarding the numbers, percentages, and socio-economic status (SES) of pupils scoring below the 40th percentile.

Ninety-three students, or 27 percent, of the total enrollment scored at or below the 40th percentile. The percentages are highest for the primary grades. Twenty-two of the 93 students scoring below the 40th percentile were low SES children using the criteria of free or reduced priced lunches. Said another way, 42 students not classified as low SES also scored at or below the 40th percentile.

The Gilbert Community School District was a trial site (as was the entire state of Iowa) for the Renewed Service Delivery System (RSDS)
Table 10. Students performing below the 40th percentile on the Iowa Test of Basic Skills, 1992 (Iowa norms)^a

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number enrolled</th>
<th>Number below 40%ile</th>
<th>Percent of class</th>
<th>Number obtaining lunches</th>
<th>Percent of class</th>
<th>Number below 40%ile</th>
<th>Percent of class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59</td>
<td>23</td>
<td>38</td>
<td>8</td>
<td>13.5</td>
<td>2</td>
<td>3.4</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>22</td>
<td>44</td>
<td>13</td>
<td>26.0</td>
<td>4</td>
<td>8.0</td>
</tr>
<tr>
<td>3</td>
<td>56</td>
<td>10</td>
<td>18</td>
<td>5</td>
<td>9.0</td>
<td>4</td>
<td>7.1</td>
</tr>
<tr>
<td>4</td>
<td>55</td>
<td>15</td>
<td>27</td>
<td>8</td>
<td>14.5</td>
<td>4</td>
<td>7.2</td>
</tr>
<tr>
<td>5</td>
<td>62</td>
<td>11</td>
<td>18</td>
<td>13</td>
<td>25.0</td>
<td>6</td>
<td>9.7</td>
</tr>
<tr>
<td>6</td>
<td>63</td>
<td>12</td>
<td>19</td>
<td>4</td>
<td>6.3</td>
<td>2</td>
<td>3.1</td>
</tr>
<tr>
<td>Totals</td>
<td>345</td>
<td>93</td>
<td>27^c</td>
<td>51</td>
<td>15.7^c</td>
<td>22</td>
<td>6.4^c</td>
</tr>
</tbody>
</table>


^bMeasure: obtaining free or reduced priced lunches.

^cThese are averages.

experiment for special education. Therefore, all special education students at Gilbert are mainstreamed into the regular classroom.

Participating Subjects

Two fifth grade and two of the three sixth grade teachers volunteered for the pilot project in mathematics. One of the fifth grade teachers provided math instruction to both fifth grades with a student enrollment of 54, while one sixth grade teacher provided math instruction to three sections of sixth graders involving a total of 65 students. All of the students in both classes, including special education students, took the summative test.
Staff Training

Professor Dick Manatt and Principal Dave Ashby believed that the staff needed additional staff development in order to provide a foundation for further curriculum and test development. Six workshops, a total of eight and a half hours, were conducted after school hours except for one early release day. The workshops were provided at no cost to the district.

The dates and topics of each workshop follow:

<table>
<thead>
<tr>
<th>Day, Date, Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, March 31, 3:00-4:30</td>
<td>Keynote: Curriculum Improvement and Assessment</td>
</tr>
<tr>
<td>Thursday, April 8, 3:30-4:30</td>
<td>A Comparison: SIM Steps and Your Curriculum</td>
</tr>
<tr>
<td>Thursday, May 6, 3:30-4:30</td>
<td>The Gilbert Assessment Project; Why Do It?</td>
</tr>
<tr>
<td>Wednesday, May 12, 3:00-4:30</td>
<td>Writing and Critiquing Test Items</td>
</tr>
<tr>
<td>Wednesday, May 19, 2:30-4:30</td>
<td>Use of Measurement for Classroom and School Improvement</td>
</tr>
<tr>
<td>Wednesday, May 26, 3:30-4:30</td>
<td>Critiquing CRMs: How To Do It</td>
</tr>
</tbody>
</table>

Summative Test

There were 54 fifth and 65 sixth grade students who took the 100-item test for their respective grade level. The test was administered over a period of four days. All data regarding the summative test were carefully reviewed and electronically scanned. The data were taped and transferred to the Iowa State University's mainframe computer where it was analyzed.
using the Standard Item Analysis program previously mentioned. This researcher was provided with a detailed printout of the results.

The Diary and Historical Review of the Process

In order to determine the primary steps in developing formative evaluation, this researcher maintained an extensive diary reporting the sequence of major events for the duration of this case study. Part I provides an overview of diary entries that directly follow. The diary is located in Appendix A. In addition to the diary, communication between Gilbert Elementary School, the School Improvement Model, and National Computer Systems was logged. Meeting minutes, memorandums, facsimiles, and the mission of the partnership can be found in the Historical Review of the Process located in Appendix B. Both appendices delineate the procedures used in this study and should prove invaluable as a rubric for future practitioners preparing to implement mastery teaching and mastery learning. It would be difficult to understand the usefulness, depth, and breadth of this study without reading both appendices.
CHAPTER IV. FINDINGS

This chapter presents the findings according to the questions posed in Chapter III. The steps relevant to the question will be addressed. The goal is to: 1) provide a model of procedures for future use to facilitate the movement towards results based education, as the term relates to the development of skills, concepts, and mastery learning; 2) provide a rubric useful to nationwide practitioners in implementing those outcomes; and 3) provide an initiative for implementing mastery teaching and learning.

1. What specifications for curriculum outcomes can be identified in the curriculum of a progressive small district which has given considerable effort to the planning process in the past three years?

Although the school had a written mathematics curriculum, it lacked specificity and relied heavily on publisher-made tests. The fifth and sixth grade teachers were asked to review the curriculum as written and make revisions as needed to include the levels of Bloom's taxonomy. They returned the revisions to Dave Ashby, the principal. Mr. Ashby entered the objectives in Performance Plus™ as this researcher read the statements aloud. There were 75 learner outcomes for the fifth grade and 92 for the sixth grade (SIM has 109 learner outcomes for fifth grade and 126 for sixth grade). At the sixth grade level there were two occasions when there were objectives with no learner outcomes attached, and on one occasion a learner outcome was discovered that did not refer to the stated
objective. A great deal of thought was given to the code hierarchy used when setting up the goals and objectives, since they were protected fields once entered. The desired outcome was to have a code established that was compatible with the code already adopted by SIM in its previous work with the original School Improvement project in Minnesota; Thermopolis, Wyoming; Monroe County, Florida; and Apache Junction, Cave Creek, Coolidge, and Maricopa County Regional Schools, Arizona. Figure 8 is a sample of how the guide is written. Figure 9 is a sample of the SIM coding format, while Figure 10 illustrates that format in the form of a curricular pyramid. Figure 11 illustrates what Gilbert Elementary School adopted as its format.

<table>
<thead>
<tr>
<th>Grade Level/Course</th>
<th>6th Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strand</td>
<td>Number Sense</td>
</tr>
<tr>
<td>Program Goal #1</td>
<td>To understand the assigned value of numbers</td>
</tr>
</tbody>
</table>

3. 10a Read and understand number terminology; whole numbers

<table>
<thead>
<tr>
<th>Grade Level/Course</th>
<th>Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. (M - 06 - NS - 1.10a)</td>
<td>[1,2,3,4]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject</th>
<th>Strand</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>Program Goal</td>
<td></td>
</tr>
</tbody>
</table>

5. Learner Outcomes

1. (Ap-M) Given a series of digits, the learner will use number terminology to correctly name the place value.

<table>
<thead>
<tr>
<th>Mastery</th>
<th>Application</th>
</tr>
</thead>
</table>

Figure 8. An example of how a SIM curriculum guide is written
The following is an explanation of the coding for the curriculum guide.

1. Each page is labeled with the subject area.

2. The strands and program goals in the boxes correlate with the scope and sequence grids.

3. The information on the left side of the page is the skill number; the label of the skill follows it. These items are also located on the scope and sequence grids.

4. Directly under the label of the skill is a code:
   a. The first symbol is the subject area (CO=Communications/Language Arts; M=Mathematics; S=Science; SS=Social Studies).
   b. The number which follows is the grade level/course.
   c. The next symbol is an abbreviation of the strand.
   d. The last numbers are the program goal and the skill within that goal.

5. If there is a test item(s) which was written for this program or goal/skill, the number(s) of it appear in [ ].

6. Under the words, Learner Outcomes, are two other symbols:
   1) On the left is the level of Bloom's taxonomy (K-Knowledge; C-Comprehension; Ap-Application; An-Analysis; S-Synthesis; E-Evaluation).
   2) The other symbol is the "level of learning" at which the learner outcome is written (I=Introduce; E=Expand; M=Mastery Expected; R=Reinforce; MM=Maintain Mastery).

The statement which follows defines what the learner will be able to do after the lesson(s) has been taught (TLW=The Learner Will).

Gilbert Elementary School does not have a stated "level of learning" or scope and sequence in writing. Instead of a scope and sequence, the teachers use the Scott Foresman textbook that has the same units (chapters) in the same order as their curriculum guide.

Figure 9. School Improvement Model (SIM) format explanation
Mathematics

Sixth Grade

Number Sense

#1: To understand the assigned value of numbers

#1.10a: Read and understand number terminology; whole numbers

Given a series of digits, the learner will use number terminology to correctly name the place value.

M - 06
NS - 1.10a
Ap - R

2. Choose the place value of the underlined digit.

.4689
A. tenths
B. hundredths
C. thousands
D. ten thousandths

Figure 10. Curricular pyramid demonstrating the sequence of the SIM format
Course - Mathematics

Grade - 6

Unit 1
Unit 2
Unit 3
Unit 4
Unit 5
Unit 6

Outcome 1
Outcome 2
Outcome 3
Outcome 4
Outcome 5
Outcome 6

Bloom's Taxonomy Level

* Objectives
1
2
3

* Several questions at each objective.

Figure 11. Curriculum hierarchy of Gilbert Elementary School
2. How can the very complex and detailed SIM curriculum and the array of assessment items be properly connected to that district’s curriculum?

A sample SIM format in mathematics would be: M-06, NS-1.10a, Ap-R. Viewed another way:

Course/Grade: M-06,
Strand/Program Goal/Skill: NS-1.10a,
Taxonomy/"Level of Learning": Ap-R (Bloom’s).

Gilbert’s format as written in Performance Plus™: 06-01-04-AP-05; only five fields are possible (allowing up to ten characters/numbers total). Viewed another way:

Grade: 06,
Strand: 01,
Program Goal: 04,
Taxonomy: AP (Bloom’s),
The Learner Will: 05.

Notice the slight difference in how the Gilbert format is written. Performance Plus™, as it is currently written, allows for a maximum of ten numbers or letters to label the five fields. For some reason the program is set so that each page is alphabetized according to the taxonomy levels listed on a page. At the top of each page is the subject title. In order to change a code in Performance Plus™, the entire hierarchy

---

¹Performance Plus™ is simply a computer format for entering curriculum that has already been created. It is used to hook test items to that curriculum to allow reporting of student performance results.
needs to be retyped, including the goal statements, student objectives, and learner outcomes, since these are protected fields once entered.

Once the math curriculum was typed (three times due to revisions on the hierarchy) and given to the teachers for proofreading and approval, they decided that the outcomes needed to follow the sequence of the textbook being used. In order to accommodate the teachers, the entire curriculum had to be reentered. Due to the familiarity with the program, Mr. Ashby and this researcher required only 1½ hours to reenter the entire mathematics curriculum instead of the original five. Because of the data entry limitations, the structure of the software was found to be rigid for educational needs. NCS has since indicated that their new software will alleviate many of these problems.

The fifth and sixth grade mathematics printout (content and format) of Performance Plus™ has become the curriculum guide for these two grade levels. There are 76 learner outcomes for fifth grade and 92 learner outcomes for sixth grade mathematics. The curriculum is well delineated and quite specific with appropriate linkage to test items via code numbers.² It should be noted that the conditions of learning is one component of the learner outcomes that is part of the SIM curriculum but not Gilbert’s. A copy of both the fifth and sixth grade mathematics curriculum can be found in Appendix C.

²It is important to note that Performance Plus™ and the test generator are two different entities and are not directly linked, which causes some user difficulties.
The Bridging Document Developed to Link the SIM and Gilbert Curricula

The intent of the bridging document was to provide the link between Gilbert Elementary School's curriculum and the curriculum that SIM had developed in working with client districts. It was a template, or a control document, that delineated the steps needed in order to determine what goals matched. If there was no match, the Gilbert teachers had to decide whether the goal fit their curriculum. If so, they needed to write it. The same was true with SIM test items. When completed, the goals reflect a learner outcome and there had to be identification with Bloom's taxonomy. A copy of the bridging document can be found in Appendix D.

One critical discovery moment occurred when the teachers saw the goals, previously written in the Performance Plus™ format, and realized that some of them needed to be rewritten to make them more specific. The bridge called for certain quality standards in the link between objectives, learner outcomes, goals, and a logical alignment between them. Although the SIM curriculum included introducing, extending, mastery, and maintaining mastery, the staff chose to concentrate on only mastery levels.

The SIM materials comprise the original curriculum developed by Hot Springs Number 1, Thermopolis, Wyoming (Manatt & Holzman, 1991), which was used as the basis of the Monroe County, Florida's SIM project. In that project the fifth and sixth grade mathematics curriculum had these elements: goals, strands, learner outcomes, and test items spanning a 116-page guide, plus test booklets. SIM also made available to Gilbert
the Project Assure test items that had been revised by National Computer Systems (NCS) and given to SIM to use for the Gilbert study.

National Mathematics Standards

Although not directly specified in the bridging document, the researcher checked the goals written by the Gilbert teachers to determine if they were aligned to the recommended standards of the National Council of Teachers of Mathematics (NCTM, 1989) for grades 5 through 8. Twelve of the 13 standards were addressed in some form by the written goals. The only exception was Standard Number 2, *Mathematics as Communication*. Even though many goals written by the Gilbert teachers were aligned to the standards, the reader is reminded that the NCTM standards were completed after Gilbert had built its curriculum. A complete list of the National Mathematics Standards for grades 5-8 can be found in Appendix E.

3. What are the primary steps in developing procedures for formative evaluation of students rather than pre/post testing?

Mr. Ashby, the principal, provided substitutes for the fifth and sixth grade teachers so that they could spend the entire day writing test items for their respective unit tests. This researcher assisted teachers Mike Korf and Donna Holtan in writing multiple choice test items for unit five in sixth grade math.

During this session, three questions were written for each outcome, a total of 37 test items (actually wrote one-third of the items). Samples were taken from textbooks (Scott Foresman), other test publishers (Project
Assure), SIM, or created by the teachers. The teachers noticed that some of the outcomes did not match the objectives that they had written earlier in the year. When writing the four foils, a great deal of care was given to rotating the correct answers between A, B, C, and D so as not to establish a predictable pattern. Much thought was also given to the incorrect answers in order to better determine the students' thought process if they chose a particular answer. The comment was made that teachers do not frequently do this. Such care in selection would help in the reteaching efforts. The test question format, developed by Mr. Ashby, helped focus on the technique for writing questions. Figure 12 illustrates that format.

One week later, this researcher also assisted fifth grade teachers Dorothy Rust and Mary Stratton with writing test items for chapter five in

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**Teacher Test Item Generation Form**

**Question Type:** (Circle One) T-F, Multiple Choice, Matching, Fill-in, Essay/Problem

**Question:**

**Answer:**

A. (T)  
B. (F)  
C.  
D.  
E.  

**Correct Answer:** A(T), B(F), C, D, E

**Reference (Page in text):**  
**Figure (yes no):**  
**Location of figure:**

**Lines before item:**  
**Lines after item:**

**Difficulty:** Easy, Medium, Difficult

**Discrimination:** Low, Medium, High

**Taxonomy:** Kn Co Ap An Sy Ev

**Grade:**  
**Objective code:**  
**Chapter/Unit:**

**Source:** (i.e., Gilbert, Scott Foresman, etc.)

---

**Figure 12.** Teacher test item generation form
their text (Scott Foresman). The problems involved division of whole numbers. Both teachers spent much time selecting the test items as well as the foils containing the incorrect answers. One of the teachers stated that: "These will tell us what the child is not understanding, which will help us with reteaching. The tests we use now don't help us with that."

These two teachers decided that there would be five items for each outcome. The teachers wrote or selected 57 test items (actually wrote two-thirds of the items) for the unit test.

Both groups administered the tests a week later and were quite pleased with how their students performed. Mr. Ashby scanned the student answer sheets and printed out both a class report and individual student reports.

The teachers wrote the next unit test on their own. The sixth grade assessment seemed to go well, with the students performing as expected. Mr. Ashby again printed class and student reports. On the other hand, the fifth grade teachers were displeased with their results. Many students performed less well than expected, with few attaining mastery of the material. Both teachers were quick to blame themselves for not having taught the material adequately. Mr. Ashby and this researcher believed the problem lay elsewhere, perhaps in the format of the question.

The scanner was tested and proved to be in working order. The scan forms were checked to determine if they were mismarked. This proved not to be the problem either. While reviewing the test booklets, it became evident that mixing four foils and five foils could be a confounding factor, as was the selection "not given" for some of the questions (that
option was not available on the sixth grade test). Mr. Ashby and this researcher hand-scored each student test to determine if these two factors were too much of a distractor for the students. Table 11 illustrates what was found when the test booklets were hand-scored. The foil "not given" proved to be a disproportionate distracter that when chosen provided no relevant data regarding the students' thought process. Although "not given" was either the fourth or fifth foil, the switching from four to five back to four foils could not be demonstrated as distracting in student responses. It would seem logical, though, not to mix the number of foils within a test but to remain consistent with one pattern in order to reduce the ambiguity for students.

4. How can interval or segmented testing be built upon summative testing that is now a part of the School Improvement Model?

Teachers selected items for the sixth grade summative test from the Scott Foresman textbook, SIM, revised items from Project Assure provided

Table 11. Difficulties with unit test six for two fifth grade classes

<table>
<thead>
<tr>
<th>Difficulties</th>
<th>Frequency of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Marked &quot;not given&quot; incorrectly</td>
<td>87</td>
</tr>
<tr>
<td>• Did not mark &quot;not given&quot; and should have</td>
<td>34</td>
</tr>
<tr>
<td>• Incorrect answer</td>
<td>66</td>
</tr>
<tr>
<td>• Possibly guessed (no work shown)</td>
<td>2</td>
</tr>
<tr>
<td>• Marked the correct answer in the booklet but marked the incorrect bubble</td>
<td>1</td>
</tr>
<tr>
<td>• Marked answer &quot;E&quot; when there was none</td>
<td>3</td>
</tr>
<tr>
<td>Class 1 (N=28)</td>
<td></td>
</tr>
<tr>
<td>Class 2 (N=26)</td>
<td></td>
</tr>
</tbody>
</table>
by National Computer Systems (NCS), or wrote their own items. In addition
to these sources, the fifth grade teachers also selected items from two
additional texts, Heath and Holt Rinehart. The 100 items selected from
these sources covered the first six units of the curriculum guide written
by the teachers, using Performance Plus™, earlier in the year. The units
also corresponded to the first six chapters of the Scott Foresman text
used by both grade levels. The mathematics teachers spent two to three
weeks of instruction on each of the units. The six units included:
1) Addition and Subtraction of Whole Numbers, 2) Multiplication of Whole
Numbers, 3) Division of Whole Numbers, 4) Addition and Subtraction of
Decimals, 5) Multiplication and Division of Decimals, and 6) Measurement
(Customary). There was no formalized program for enrichment activities
during the reteach phase. Most of the reteaching was done as a
supplemental activity in small groups. The questions incorporated Bloom's
taxonomy levels judged by the teachers to be at the application, analysis,
and evaluation levels. The fifth grade test also included several items
at the knowledge level.

Sixth grade was the first test written. It took approximately 5
hours for two sixth grade teachers and this researcher to select 100 test
items. The source, page number, and the problem number were recorded and
given to this researcher who then spent two 10-hour days typing the items,
the key, and proofreading both. Copies were given to the teachers for
additional proofreading. Three days later the same procedure was followed
with one fifth and one sixth grade teacher (one fifth grade teacher was
absent so a sixth grade teacher volunteered to assist). Because one
teacher had already gone through the process, everything seemed to move more quickly. Again, the source, page number, and the problem number were recorded and given to this researcher, who typed the test, the key, and proofread both. In this case the selection process took a little over 1 hour and 45 minutes. Since both groups of teachers had previously spent a great deal of time reviewing and writing the mathematics curriculum, they knew the goals and learner outcomes extremely well, proving the bridging document superfluous in these two situations. This would not have been the case if the teachers had not known their curriculum so thoroughly.

Mastery Level

In teaching, as in research, some assumptions have to be made regarding how high to set expectations. A common inferential statistical compromise is accepting results at the .05 level of confidence. As educators conceptualize assessment standards, they often make a similar intellectual compromise. In its planning, the district curriculum committee suggested, a priori, the educational compromise of 80 percent as the student mastery level at the end of each unit. If one views the excellence and quality paradigm as: excellence is ever improving quality and quality is performance to specifications, then the mastery level is simply an artificial specification level that can be set. SIM researchers have discovered that it is very helpful to find out what the mastery level is at the start of the year and build upon that rather than wait to the end of the year to try to meet the challenge goal. For example, in Monroe County, the Board of Education set up the challenge goal that all students
would be at the 90 percent mastery level after five years. In actuality, they achieved 83 percent average mastery with 40 percent gain in mathematics, but only a 60 percent mastery with a 20 percent gain in language arts. Social studies gains were less than 15 percent. Other districts start with a diagnostic pretest that represents the whole year’s course so that whatever is gained in achievement then becomes the benchmark.

5. Do different levels of teacher participation impact the acceptance of any model developed? (Teachers not in the experiment and teachers involved in using the product experimentally.)

The Questionnaire and Findings

The perceptions of 16 classroom teachers were surveyed to determine if the degree of participation had any effect on their acceptance of the computer management system used in the pilot project. The surveys comprised 15 questions with a five-point Likert scale indicating the degree of disagreement (1) or agreement (5) with a particular statement. Table 12 is a sample of the questionnaire. Of the 16 requested to complete the questionnaire, 14 did so with one teacher attaching a note stating that she had not used the system so could not answer the survey reliably. The surveys were analyzed according to those who were part of the experiment (N=4) and those who were not (N=9). Table 13 illustrates the mean response of the two groups of teachers. When viewing the results of the survey, it is important to realize that the size of the sample limits any meaningful predictions or generalizations to the general
### Table 12. Computer management questionnaire

#### Background Information
1. Grade level taught: ____________
2. How many of the inservice training sessions presented by Dr. Manatt did you attend? (Circle one) [1-2] [3-5] [All]

#### Curriculum
1. The district curriculum guides my planning for mathematics instruction.  
   1 2 3 4 5
2. The district/school adopted textbooks guide my planning for mathematics instruction.  
   1 2 3 4 5
3. The content specified for my grade level, in mathematics, is appropriate.  
   1 2 3 4 5
4. The math curriculum, developed for our grade level, is appropriate.  
   1 2 3 4 5

#### Assessment
5. The Iowa Tests of Basic Skills guide my planning of math instruction.  
   1 2 3 4 5
6. The tests I develop guide my planning of math instruction.  
   1 2 3 4 5
7. Student assessment information (such as Performance Plus™ printouts) is regularly used to give me feedback regarding student performance.  
   1 2 3 4 5
8. Most students in my class(es) are capable of mastering grade level math objectives.  
   1 2 3 4 5
9. I use my own criterion-referenced tests to assess math skills of my students.  
   1 2 3 4 5
10. I frequently assess the progress of my students in math.  
    1 2 3 4 5

#### Computer Management System
11. I believe using the computer management system has made me more aware of the math curriculum.  
    1 2 3 4 5
12. My expectations for students in mathematics have increased.  
    1 2 3 4 5
13. My expectations for students in mathematics have remained the same.  
    1 2 3 4 5
14. My expectations for students in mathematics have decreased.  
    1 2 3 4 5
15. I believe that using the computer management system has made me a better math teacher.  
    1 2 3 4 5
Table 13. Mean levels of acceptance of computer management system by teachers

<table>
<thead>
<tr>
<th></th>
<th>Computer management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N=4)</td>
</tr>
<tr>
<td>User</td>
<td></td>
</tr>
<tr>
<td><strong>Curriculum</strong></td>
<td></td>
</tr>
<tr>
<td>1. The district curriculum guides my planning for mathematics instruction.</td>
<td>4.8</td>
</tr>
<tr>
<td>2. The district/school adopted textbooks guide my planning for mathematics instruction.</td>
<td>4.5</td>
</tr>
<tr>
<td>3. The content specified for my grade level, in mathematics, is appropriate.</td>
<td>4.5</td>
</tr>
<tr>
<td>4. The math curriculum, developed for our grade level, is appropriate.</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
<td></td>
</tr>
<tr>
<td>5. The Iowa Tests of Basic Skills guide my planning of math instruction.</td>
<td>1.8</td>
</tr>
<tr>
<td>6. The tests I develop guide my planning of math instruction.</td>
<td>4.0</td>
</tr>
<tr>
<td>7. Student assessment information (such as Performance Plus™ printouts) is regularly used to give me feedback regarding student performance.</td>
<td>3.5</td>
</tr>
<tr>
<td>8. Most students in my class(es) are capable of mastering grade level math objectives.</td>
<td>4.5</td>
</tr>
<tr>
<td>9. I use my own criterion-referenced tests to assess math skills of my students.</td>
<td>4.8</td>
</tr>
<tr>
<td>10. I frequently assess the progress of my students in math.</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Computer Management System</strong></td>
<td></td>
</tr>
<tr>
<td>11. I believe that using the computer management system has made me more aware of the math curriculum.</td>
<td>5.0</td>
</tr>
<tr>
<td>12. My expectations for students in math have increased.</td>
<td>3.0</td>
</tr>
<tr>
<td>13. My expectations for students in math have remained the same.</td>
<td>5.0</td>
</tr>
<tr>
<td>14. My expectations for students in math have decreased.</td>
<td>1.5</td>
</tr>
<tr>
<td>15. I believe that using the computer management system has made me a better math teacher.</td>
<td>3.3</td>
</tr>
</tbody>
</table>
population and should be viewed only as indicating a possible trend in this particular situation.

There appears to be some indication that both groups base math instruction on teacher-made tests (question 6), but the teachers familiar with the management system tended to assess their students more frequently (question 10) and viewed the assessments as criterion-referenced measures. There seems to be a difference in the awareness levels of the mathematics curriculum (question 11) between the two groups. The teachers who were part of the pilot constantly reviewed the mathematics curriculum to determine the appropriateness of the goals, learner outcomes, and test items. This familiarity with the curriculum (what they were doing and why they were doing it) may prove to be an additional advantage for implementing a management system. It is interesting to note that neither group seems to use the information from the Iowa Tests of Basic Skills for their instructional planning in mathematics.

6. What specifications, with and without summative measures, are appropriate for formative testing?

Content validity and reliability are terms that refer to whether the test measures what the teacher intends for it to measure in a particular class situation (content validity) and whether the test can be expected to produce consistent results (reliability). Validity encompasses reliability; that is, a test cannot be useful in assessing student knowledge unless it can be depended upon to produce consistent results. Reliability, a statistic estimating how consistently the test measures, is
established after the test has been scored and analyzed (Manatt, 1988, pp. 1-2).

Both the fifth and sixth grade mathematics teachers wanted to develop a unit test of their own before the 100-item test was given. They, in fact, made four unit tests and administered them to their students before checking the test items for reliability and validity. It was from these unit tests that the 100-item summative test derived (later known as the "mega test").

Standard Examination Analysis

The 100-item criterion-referenced test (CRT) was scored by the Durham Computer Center's National Computer Systems (NCS) scanner where student scores were printed on legal sized sheets. During the scanning, actual student responses were recorded on tape. The data were then transferred to the mainframe computer where the scoring process was done again using the Standard Item Analysis program. The statistical program was developed in 1972 by Jack Menne, Director of Student Affairs and Research. The program has been refined several times since then. Originally written in FORTRAN, the program has been translated to PASCAL so that it can run on MS-DOS machines. The analysis from this program includes the following reports: 1) Distractor and Item Analysis, 2) Measurement Characteristics of the Test, and 3) Class Lists.
Distractor and Item Analysis

The first printout provides information about individual items on the test. The distractor analysis reports the frequency with which students select each foil (a foil represents a possible response on a multiple choice test). The correct response, as marked on the test key, is indicated by the "#" sign.

To the right of the distractor analysis is the item analysis which includes: the number of students, omitting the question, attempting to answer the question, or who selected the correct response. In addition, it shows the item difficulty, the percentage of students answering the item correctly, and the item-score correlation/discrimination (Manatt, 1988, p. 4). Table 14 illustrates the combined fifth grade item analysis results, while Table 15 is the combined sixth grade printout of results.

Item difficulty

Item difficulty, the percentage of students answering the item correctly, can range from 0 to 100 percent in a class with a wide variety of student abilities. Items in the medium range of difficulty, 30-70 percent, result in higher item discrimination and thus better separate students according to levels of mastery (Manatt, 1988, p. 5). On a summative test intending to measure mastery achievement, student scores would tend to cluster around 80 percentile or higher, resulting in what is commonly called a J-shaped curve (see Figure 5, Chapter II).

At first glance, one would judge the items to be too easy due to the number of high scoring students. It is likely, though, that the students
Table 14. Distractor and item analysis printout, fifth grade combined (Spring 1994)*

<table>
<thead>
<tr>
<th>Item</th>
<th>1/A</th>
<th>2/B</th>
<th>3/C</th>
<th>4/D</th>
<th>OMIT</th>
<th>NA</th>
<th>NR</th>
<th>DIFF</th>
<th>DSCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>53#</td>
<td>1</td>
<td>0</td>
<td>54</td>
<td>53</td>
<td>98</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>46#</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>54</td>
<td>46</td>
<td>85</td>
<td>0.20</td>
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<tr>
<td>3</td>
<td>0</td>
<td>53#</td>
<td>1</td>
<td>0</td>
<td>54</td>
<td>53</td>
<td>98</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>51#</td>
<td>1</td>
<td>0</td>
<td>54</td>
<td>51</td>
<td>94</td>
<td>0.24</td>
<td></td>
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<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>54</td>
<td>47</td>
<td>87</td>
<td>0.49</td>
</tr>
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<td>6</td>
<td>0</td>
<td>1</td>
<td>52#</td>
<td>1</td>
<td>0</td>
<td>54</td>
<td>52</td>
<td>96</td>
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<tr>
<td>7</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>40#</td>
<td>0</td>
<td>54</td>
<td>40</td>
<td>74</td>
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<tr>
<td>8</td>
<td>48#</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>54</td>
<td>48</td>
<td>89</td>
<td>0.63</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>47#</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>54</td>
<td>47</td>
<td>87</td>
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</tr>
<tr>
<td>10</td>
<td>50#</td>
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<td>0</td>
<td>0</td>
<td>54</td>
<td>50</td>
<td>93</td>
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<td>11</td>
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<td>53</td>
<td>98</td>
<td>-0.09</td>
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<td>0</td>
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<td>13</td>
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<tr>
<td>15</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>49#</td>
<td>0</td>
<td>54</td>
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*Key: OMIT-Number omitting the item; NA-Number attempting the item; NR-Number answering correctly; DIFF-Item difficulty-% right; DSCR-Item discrimination-item-score correlation.

#Indicates correct answer.
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\textsuperscript{a}Key: OMIT=Number omitting the item; NA=Number attempting the item; NR=Number answering correctly; DIFF=Item difficulty-% right; DSCR=Item discrimination-item-score correlation.

#Indicates correct answer.
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simply had mastery of the learner outcomes. The test should be given in the fall of 1994 as a pretest to be sure that this is not the case.

**Item discrimination**

Negative values indicate an inverse relationship between the total score and the score on the item. Specifically, students scoring high overall on the exam miss the item while students scoring low on the exam answer the item correctly. In reviewing Table 14, item numbers 11, 17, 26, and 40 have a negative relationship indicating little discrimination power. A similar phenomenon also exists with item numbers 50, 55, 66, 77, 89, and 100 in Table 15. Although these items detract from the reliability of the exam, the item needs to be studied carefully to determine the probable reason for the negative value before deciding to eliminate or rewrite the item. Items with a zero value for item discrimination fall into three categories:

1. Virtually all students responded correctly to the item.
2. Virtually all students responded incorrectly to the item.
3. There is no relationship between student scores on the item and their total scores; students in both low scoring and high scoring groups missed the item randomly (Manatt, 1988, pp. 4-5).

Items that all students answer correctly may be designed to be confidence enhancers or they may indicate mastery of content which would be expected if the test was designed for that purpose. Conversely, items that all students missed may be poorly written, miskeyed, or represent content that no student has yet mastered. In the third case, where there is no
discernible pattern to the students' responses, the item should probably be discarded or rewritten (Manatt, 1988, p. 8).

Test Characteristics

The second analysis provides the overall measurement characteristics of the test. These statistics demonstrate how well the test can be relied on to give consistent results, the degree of error inherent in the scores, and the confidence one can assume in interpreting individual student scores. Additionally, statistics such as the mean, standard deviation, and variance help describe the distribution of scores.

The Kuder-Richardson method measures the extent to which items within a test have much in common with one another. The strength of this estimate of reliability depends on the extent to which the entire test represents a single, consistent measure of a concept. There are two forms of this procedure: 1) The Kuder-Richardson Formula 21 (KR-21) is the least cumbersome of the two and only requires a knowledge of the number of test items (n), the mean of the test (x), and its standard deviation(s). 2) The Kuder-Richardson Formula 20 (KR-20) is more involved since it also requires the percentage of students passing each item on the test. Of the two procedures, KR-20 tends to produce a more accurate and conservative coefficient of internal consistency (Kubiszyn, 1987, p. 295).

Coefficients of internal consistency techniques are useful measures of reliability in that they involve only one test administration and are free from memory and practice effects. There are cautions that need to be noted when interpreting the KR-20 of a test. First, it can only be used
if the entire test consists of similar items measuring a single concept or subject. It would be appropriate to use it on a spelling test but not a language test involving a spelling section (error of measure).

A second problem is that measures of internal consistency yield inflated estimates of reliability when used with tests having strict time limits. This problem is corrected when "power tests" (which have no time constraints) are used since mastery of a subject is sought rather than the number of items attempted (Kubiszyn, 1987, p. 296).

In their original article, "The Calculation of Test Reliability Coefficient Based on the Method of Rational Equivalence," Richardson and Kuder (1939) demonstrated that the estimation of test reliability values computed by their Formula 20 produced results that closely approximated those computed by more rigorous and time-consuming formulas (pp. 681-687). The Kuder-Richardson Formula 20 is considered by many specialists in educational and psychological measurement to be the most satisfactory method of determining reliability (Borg & Gall, 1989, p. 261).

The Kuder-Richardson 20 (KR-20) index of reliability formula is:

\[
r = \frac{k}{k-1} \left[ 1 - \frac{\sum pq}{s^2} \right]
\]

(Bloom et al., 1981).

In this formula, \( r \) is the reliability coefficient. The letter \( k \) represents the number of items in the test. The symbol \( \sum \) means the sum of. The letter \( p \) stands for the proportion of students passing (giving the correct answer) on a given item, and \( q \) represents the proportion not passing (giving the wrong answer). The figures for \( p \) and \( q \) must add up to 1.00. The symbol \( s^2 \) stands for the square of the standard deviation.
Test Reliability

One method of examining the Kuder-Richardson 20 correlation is by looking at the strength of the relationship. Correlations greater than ±.70 often define a strong relationship. Correlations between ±.30 and .70 define a moderate relationship. Less than .30 are considered as weak or having no relationship (Hinkle, Wiersma, & Jurs, 1988). For those items with a discrimination index of .20 or less, the classroom teachers need to review the test items to determine if they are too easy and need to be replaced. In Table 15, the X opposite items 46 and 89 indicates less than 10 percent responding to the item correctly. Examining the two items closely, it was discovered that the selections had been miskeyed.

KR-20 reliability estimate may vary from 0.0 (no reliability) to 1.00 (perfect reliability). For a norm-referenced classroom test, the higher the KR-20 the better, especially if the test is designed to measure mastery levels. Table 16 provides a summary of the fifth grade combined results from the summative test, and Table 17 summarizes the sixth grade test. Note that the KR-20 reliability estimate for the fifth grade is 92 and 85 for the sixth grade test, indicating both tests to be highly reliable. In order to make the J-shaped curve clearer, rotate the page counter-clockwise and view the asterisks forming the curve. Notice how the asterisks (each representing one student) tend to cluster around the mastery scores. For these two classes, the tail on the J-shaped curve (Table 16, scores 45-79; Table 17, scores 65-78) is a function of inclusion (i.e., carrying some special education students in a regular class).
Table 16. Measurement characteristics of the fifth grade combined (Spring 1994)

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<tr>
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<td>51</td>
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<td>688</td>
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<tr>
<td>97</td>
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<td>53</td>
<td>98</td>
<td>698</td>
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<tr>
<td>98</td>
<td>1</td>
<td>54</td>
<td>100</td>
<td>607</td>
<td>*</td>
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</tbody>
</table>

KR-20 Reliability estimate = 0.92  Number of scored items = 100
Average test score = 87%  Number taking test = 54
Error variance = 8.56  Mean = 86.83
Standard error of measurement in raw scores = 2.93  Variance = 108.36
Standard error of measurement in t-scores = 28.11
Table 17. Measurement characteristics of the sixth grade combined (Spring 1994)

<table>
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<tr>
<th>Score</th>
<th>N</th>
<th>Cum</th>
<th>%ile</th>
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<td>2</td>
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<td>598</td>
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<td>1</td>
<td>65</td>
<td>100</td>
<td>639</td>
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</table>

KR-20 Reliability estimate = 0.85  Number taking test = 65  
Average test score = 88%  Number of scored items = 100  
Error variance = 8.34  
Standard error of measurement in raw scores = 2.89  Mean = 87.69  
Standard error of measurement in t-scores = 38.91  Variance = 55.11
Standard error of measurement

A test with less than perfect reliability has error associated with each score. The standard error of measurement is an index of error and is computed for each test from its reliability and standard deviation. In the second printout, it is reported in both raw scores and t-scores. Individual student scores are estimates of true scores. The standard error of measurement put the individual score within a band of scores. For example, in Table 16 the standard error of measurement in raw scores is ±2.93. A student scoring 71 on the test would fall within the range of 68.48 to 72.52. Table 16 illustrates the fifth grade printout (combined, two classes) with the measurement characteristics of a test, while Table 17 is the sixth grade example (all three classes).

The final printouts include two class lists. The third report is in alphabetical order by last name, and includes name, identification number, raw score, t-score, and the number of questions omitted for each student. The fourth printout lists identification numbers in sequential order, raw score, t-score, and an answer grid. The answer grid identifies which questions each student missed, as well as the incorrect answer the student gave on that item. This grid is helpful in examining how the best and weakest students performed on the test.

7. If teachers, students, parents, and administrators are going to be accountable for student achievement, how is information regarding progress going to be provided to parents and students?
A strong feature of Performance Plus™ are the many reports that can be generated. The "Report to Parents" provides information on the level of mastery and non-mastery achieved by a student. Figure 13 is a sample of such a report. It indicates the objective tested and whether the child has mastered that objective. If the objective has not been mastered, the

STUDENT NAME: WOODWARD RALPH
STUDENT ID: 0000001111
TEACHER NAME: DAVE ASHBY
TEACHER ID: 102
COURSE NAME: 4TH GR MATH
COURSE: 1400 SECT: 3 PER: 02
BOOKLET: MA-12345-B
GRADE: 05

STUDENT HAS ACHIEVED OVER 75% OF THESE SKILLS. IT IS RECOMMENDED THAT HE/SHE MOVE ON TO THE NEXT SEQUENCE.

MA-03-DIV-003
THE STUDENT WILL BE ABLE TO FIND THE QUOTIENT OF A 2-DIGIT NUMBER DIVIDED BY A 1-DIGIT NUMBER WITH A Remainder.

STUDENT FALLS WITHIN 30% AND 75% MASTERY OF THESE SKILLS. IT IS LIKELY THIS STUDENT WILL BENEFIT FROM REVIEW AND REINFORCEMENT ACTIVITIES. THESE CAN BE CONDUCTED WITHIN THE CONFINES OF THE CLASSROOM.

MA-03-ADD-001
GIVEN MIXED FRACTION DIVIDED BY ANOTHER MIXED FRACTION, THE STUDENT WILL FIND THE QUOTIENT.

MA-03-SUB-002
THE STUDENT WILL BE ABLE TO SUBTRACT A 1-DIGIT NUMBER FROM A 2-DIGIT NUMBER WITHOUT REGROUPING.

Figure 13. Sample Performance Plus™ report to parents
parents are informed of what needs to be done. Although these reports are sent home regularly, they can be printed up at any time providing feedback whenever requested by the parent. By the year 2000, the Gilbert staff expects to have these types of reports inform parents regarding student progress instead of the traditional report cards with letter grades. This will require educating parents not only to the new reporting format but the increased amount, quality, and specificity of information available. As part of this educating process, the staff has developed a "transition" or "interim" report card. An example of this report card can be found in Appendix F.

The Partnership

A great amount of time was spent by Gilbert, SIM, and NCS in planning and attending meetings to ensure the success of this pilot project. Gilbert needed a software package to manage its curriculum and additional criterion-referenced items to institute a formative testing program. Through its work with client districts, SIM had a robust curriculum which included criterion-referenced measures that had been pilot tested for reliability. NCS believed that Performance Plus™ was capable of meeting the needs of Gilbert and thus the partnership was formed. Table 18 is an illustration of the time committed to this pilot project by the three members of the partnership.

8. How can a computer management system facilitate the entire process of curriculum renewal and curriculum driven assessment?
### Table 18. Personnel hours from initial meeting through end of first unit test

**Beginning Date of Project:** September 8, 1992

<table>
<thead>
<tr>
<th></th>
<th>SIM</th>
<th>Gilbert</th>
<th>NCS</th>
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</thead>
<tbody>
<tr>
<td>Staff Training</td>
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<td>Staff Training</td>
<td>8</td>
</tr>
<tr>
<td>NCS Meeting</td>
<td>6</td>
<td>NCS Meeting</td>
<td>6</td>
</tr>
<tr>
<td>Open House</td>
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<td>Open House</td>
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<tr>
<td>Board Presentation</td>
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<td>Planning Coding</td>
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<tr>
<td></td>
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<tr>
<td>NCS Meeting</td>
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<td>NCS Meeting</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hosted Meeting</td>
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<tr>
<td></td>
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<td>Test Writing</td>
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<tr>
<td></td>
<td></td>
<td>Grade 6</td>
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<td>Test Writing</td>
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<tr>
<td></td>
<td></td>
<td>Grade 5</td>
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<td>Summative Test (5)</td>
<td>2</td>
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<tr>
<td>Meetings/Planning Sessions</td>
<td>26</td>
<td>Meetings/Planning Sessions</td>
<td>26</td>
</tr>
</tbody>
</table>

50 Hours^a

87 Hours

18 Hours

Total Group Hours = 155 to Reach the First Printout of Student Test Results January 6, 1994.

^aNNote: SIM developed its materials over a period of three years while working with Monroe County School District.
Software Capabilities

Performance Plus™ is a computer format for entering curriculum that has already been created. It was selected by Gilbert Elementary School to be their curriculum management software. It is published by National Computer Systems and runs only on International Business Machine (IBM) computers or similar MS-DOS machines. This software package is comprised of four integrated modules: student records both demographic and test data, criterion-referenced test processing, test generation, and prescriptions. The test generator is a different entity than the other three modules and is not directly linked, causing some user difficulties. When scanning art work to include with test items, it was found that the software allowed only 65K of memory for that purpose, which is inadequate even for simple designs. The software accommodates curriculum from test publishers and locally developed curriculum. The available reports include: student profile of mastery (see Figure 13), grouping by mastery level, summary of group mastery, parent report, and item analysis.

Implementation of the Management System

It is estimated that it took approximately 85 hours and 20 minutes to get the management system operational to the point of scoring student answer sheets and printing one set of results. Included is the trial and error time needed to become familiar with the software (8 hours), developing and revising a coding hierarchy (20 hours), entering the mathematics curriculum for fifth and sixth grade only (6 hours), overcoming the difficulty between the test generator and the software
(2 hours), writing the test items (32 hours), entering the test items (16 hours), scanning 118 answer sheets (1 hour), and printing the first class reports (20 minutes). The principal was instrumental in guiding all facets of this joint project and made the following observation:

During our curriculum development process, teachers become very familiar with objectives, goals, and assessments. They also get additional training (last spring and this summer with Dr. Manatt). We found that it takes two teachers (skilled teachers who knew what they were doing and who worked quickly and efficiently) a full day to design a 57-question test. Using a management system will force many schools to do some real curriculum work and stop kidding themselves. Hopefully, the work and research we are doing with [Dr. Manatt and Mr. Woodward] will develop some techniques for decreasing the tremendous amount of time and work it takes just to get ready to properly use a good management system. One of my teachers said, "Now that we are doing this thing with NCS, I am beginning to understand what mastery learning is all about." She meant that she was really starting to get a handle on what she taught, what was expected, what the kids really learned, and how to [help them achieve] true mastery. (Ashby, 1994)

The Diary and Historical Review of the Process

In order to determine the primary steps in developing formative evaluation, this researcher maintained an extensive diary reporting the sequence of events for the duration of this case study. The diary is located in Appendix A. In addition to the diary, communication between Gilbert Elementary School, the School Improvement Model at Iowa State University, and National Computer Systems was logged. Meeting minutes, memorandums, facsimiles, and the mission of the partnership can be found in the Historical Review of the Process located in Appendix B. Both appendices delineate the procedures used in this study and should prove
invaluable as a rubric for future practitioners in implementing mastery teaching and mastery learning.
CHAPTER V. SUMMARY, CONCLUSIONS, LIMITATIONS, DISCUSSION, AND RECOMMENDATIONS

In the spring of 1993, a partnership was formed comprised of Gilbert Elementary School, SIM, and the National Computer Systems (NCS) of Eden Prairie, Minnesota. The partners researched the feasibility of improving teaching and learning the use of curriculum renewal and alignment, computer monitoring of instruction, and computer-generated formative and summative assessment. NCS contributed some of the computer hardware and all of the software. The company has also made available fifth and sixth grade test items from the Project Assure item banks as well as technical support in setting up the management system.

Summary of Methodology

This study was conducted with the purpose of determining the feasibility of bridging from the existing and renewed curriculum of a district to the curriculum and assessment materials based on research by the School Improvement Model (SIM) at Iowa State University's College of Education. The research provides a direction and samples of each sequential step needed to incorporate goals and assessment components between the two curricula. The steps included: 1) the assessment of current status of content and curriculum goals for the target subject, mathematics, 2) staff training to provide a foundation for further curriculum and test development, 3) computerization of all curriculum management activities and assessments for mathematics at the fifth and sixth grade levels; 4) identification of strengths and limitations to the
software package adopted for future users, 5) testing of all aspects of the strands, program goals, taxonomy levels, and learner outcomes, 6) documentation of all the activities and their sequence used to bring the project to its present status, and 7) assessment of the effectiveness of the model and making suggestions for revisions.

Summary of Findings

1. Although the school had a written mathematics curriculum, it lacked specificity and relied heavily on publisher-made tests. The fifth and sixth grade teachers were asked to review the curriculum as written and make revisions as needed to include the levels of Bloom's taxonomy. At the sixth grade level there were two occasions when there were objectives with no learner outcomes attached, and on one occasion a learner outcome was discovered that did not refer to the stated objective.

2. The bridging document was intended to provide the link between Gilbert Elementary School's curriculum and the SIM curriculum. It was a template, or a control document, that delineated the steps needed in order to determine what goals matched. Since the fifth and sixth grade teachers had previously spent a great deal of time reviewing and writing the mathematics curriculum, they knew the goals and learner outcomes extremely well. The bridging document proved useful for this researcher and easy to use for the teachers who worked with the curriculum every day.

3. A great deal of thought was given to the code hierarchy used when setting up the goals and objectives, since they are hooked to test results and learner outcomes. The software package, Performance Plus™, insisted
upon that because the goals and objectives, once entered, were protected fields. There were only five fields possible (course/grade, unit or strand, program goal, taxonomy level, learner outcome). Because of these data entry limitations, the structure of the software was found to be rigid for educational needs. A different relational data base could easily solve these difficulties.

4. When writing the four foils, the teachers took a great deal of care to rotate the correct answers between A, B, C, and D so as not to establish a predictable pattern. Much thought was also given to the incorrect answers in order to better determine the students' thought process if they chose a particular answer. The comment was made that teachers do not frequently do this.

5. When the fifth grade teachers provided the response "not given" to the students taking a unit test, students frequently chose this response over the other answers. Since the Iowa Tests of Basic Skills provides a response "none of the above," it would be interesting to determine what the responses are when this option is not provided.

6. The teachers decided that 80 percent will be the mastery level for the end of unit tests. At this time, there is no provision for reinforcing and maintaining mastery. If long-term mastery is to be achieved, then this process will need to be developed as part of the curriculum. There is no scope and sequence other than that provided by the textbook. Unless the school decides on its own scope and sequence, adopting a different text series could be problematic.
7. When comparing teachers who were part of the experiment and those who were not, there is an indication that the two groups base mathematics instruction on teacher-made tests, but the teachers familiar with the management system tended to assess their students more frequently and viewed the assessments as criterion-referenced measures. When answering the survey question, "I believe using the computer management system has made me more aware of the math curriculum," there seemed to be a difference in the awareness of the mathematics curriculum between the two groups. Those teachers participating in the pilot project tended to believe they had become more familiar with the mathematics curriculum. This would be a logical conclusion, since they constantly reviewed the mathematics curriculum to determine the appropriateness of the goals, learner outcomes, and test items. This familiarity with the curriculum may prove to be an additional argument for implementing a management system.

8. The KR-20 reliability estimate for the fifth grade test was found to be .92 and .85 for the sixth grade test, indicating both summative tests to be highly reliable and useful for developing formative assessments. Individual test items were reviewed for discrimination power to determine their usefulness for formative assessments. Those items found to be inadequate were rewritten or discarded.

9. From the first meeting between SIM and Gilbert (and later with NCS), a total of 155 groups hours were committed to reach the first printout of student test results. These hours do not include the time spent by SIM developing its materials over a period of three years while
working with Monroe County School District nor the time spent installing
the management system on site.

10. At the school site, it is estimated that it took 85 hours and 20
minutes to get the management system operational to the point of scoring
the first set of student answer sheets and printing one set of results.

11. The test generator and the software are two different entities
which create difficulties for the user. When scanning art work to include
with test items, it was found that the software allowed only 65K of memory
for that purpose, which was inadequate even for simple designs.
Performance Plus™ was a complicated system requiring a great deal of
computer experience to operate.

Conclusions

First research question

What specifications for curriculum outcomes can be identified in the
curriculum of a progressive small district which has given considerable
effort to the planning process in the past three years?

The previous mathematics curriculum lacked specificity and relied
heavily on publisher-made tests. Using the bridge first then entering the
mathematics curriculum in Performance Plus™ shell, chosen as Gilbert’s
management system, forced the teachers to review their written curriculum
before and after it was entered into the platform. The fifth and sixth
grade teachers wrote additional test items to match their previously
developed learner outcomes.
Second research question

How can the very complex and detailed SIM curriculum and the array of assessment items be properly connected to that district's curriculum?

The bridge, with the SIM curriculum on one side, directed attention back to their learner outcomes. The management system allows a maximum of ten numbers or letters to label the five fields. This limits the ability of Gilbert to match exactly the code hierarchy SIM previously developed. The Gilbert teachers have chosen to use the term "unit" instead of "strand" as used in the SIM curriculum.

Third research question

What are the primary steps in developing procedures for formative evaluation of students rather than pre/post-testing?

Hooking strands of SIM to units of Gilbert and hooking learning outcomes together and writing or selecting more test items are the steps for developing formative assessments. This test needs to be pilot tested to check for validity and reliability of the test items before using them in formative assessments.

Fourth research question

How can interval or segmented testing be built upon summative testing that is now a part of the School Improvement Model?

The SIM test items which have already been piloted for reliability and validity can be combined with the new pool of test items as a result of the piloted summative test. Assured of their reliability and
discrimination power, these items can now be used in subsequent formative or segmented testing. The teachers are very comfortable with testing for units which last two to three weeks. Now they must develop shorter tests to be used every day or two.

Fifth research question

*Do different levels of teacher participation impact the acceptance of any model developed (teachers not in the experiment and teachers involved in using the product experimentally)?*

Neither group of teachers was following the curriculum they had developed, relying extensively on textbook materials. The results indicate that both groups (teachers who were part of the experiment and those who were not) base math instruction on teacher-made tests (survey question 6), but the teachers familiar with the management system tended to assess their students more frequently (survey question 10) and viewed the assessments as criterion-referenced measures. Teacher-made assessment was driving the instruction and not the curriculum. There seems to be a difference in the awareness levels of the mathematics curriculum (survey question 11) between the two groups. The teachers who were part of the pilot constantly reviewed the mathematics curriculum to determine the appropriateness of the goals, learner outcomes, and test items. This familiarity with the curriculum (what they were doing and why they were doing it) may prove to be an additional advantage for implementing a management system. It is interesting to note that neither group seemed to use the information from the Iowa Tests of Basic Skills for their
instructional planning in mathematics. The results must be viewed tentatively since the sample size was small.

Sixth research question

What specifications, with and without summative measures, are appropriate for formative testing?

There should be high reliability, there should be good mastery, and the items should have discrimination power. The fifth and sixth grade mathematics teachers developed four unit tests and administered them to their students before checking the test items for reliability and validity. It was from these unit tests that part of the 100-item summative test derived (later known as the "mega test"). On the fifth grade summative test, 96 items out of 100 proved to be good items, with a reliability coefficient of .92 and a standard deviation of 10.41. The sixth grade summative test had 93 usable items with a reliability coefficient of .85 and a standard deviation of 7.42.

Seventh research question

If teachers, students, parents, and administrators are going to be accountable for student achievement, how is information regarding progress going to be provided to parents and students?

Hooking strands of SIM to units of Gilbert and hooking learning outcomes together and writing or selecting more test items are the steps for developing formative assessments. For its unit tests in mathematics, Gilbert Elementary School has made use of the individual student report,
parent report, and class item report. The reports were found to be useful. When using the Performance Plus™ platform, the student diagnostic information must be entered separately.

Eighth research question

*How can a computer management system facilitate the entire process of curriculum renewal and curriculum driven assessment?*

The computer management system holds the curriculum which are the instructions for teacher instructional planning. Tied to these teaching and learning instructions are test items to measure the students' success learning the concepts. The platform keeps track of performance data and generates reports for each student, class, group of classes, or all of the grade levels in a school. It also informs the teacher which of the learner outcomes have not been mastered and need to be retaught. These reports are immediately available to the teacher for classroom teaching decisions, to the parents for monitoring their child, and to the administrator for school-wide decisions. This process is too complex for traditional paper/pencil methods, but becomes useful when a computer management system is utilized. Performance Plus™ is too complicated for the teachers to use directly, so it requires the creation of a systems operator position at the site level.

Limitations of the Study

A number of limitations resulted from the nature and design of this study. They were:
1. This study was limited to four classroom teachers from the same school who volunteered to be in the pilot project. This action may indicate unique attributes and a greater commitment to ensuring the success of the project.

2. The two sections of fifth grade and the three sections of sixth grade used in this study comprised a total of 119 students. Neither the socio-economic status nor the ethnic background of the students was considered.

3. The sample of teachers surveyed regarding different levels of participation in the project was too small to generalize to other populations. The results need to be viewed with caution.

4. The management software adopted by the school proved to be difficult to use. Only Mr. Ashby's knowledge of computers and computer software may have assured the success of the management system selected.

5. This study was limited to one K-6 school in Iowa with an enrollment of 372 students located within six miles of a major university. The proximity to the university historically has influenced the kinds of parents, school boards, and children in Gilbert.

Discussion

The clear message of school reform is the need to examine basic philosophical beliefs about teaching, learning, the nature of students, and the kinds of environments that maximize growth for both teachers and students. A great need exists to sort out personal values, develop new belief systems, and ultimately create schools that educate as well as
train, schools that foster learning in all ways it can occur (Michaels, 1988). The primary task of the teacher, in fact, should be to structure events and activities that bring young people across the threshold of a commitment to learn.

When giving teachers great leeway, it appears logical that an outcome based approach to education must be used to properly fit the new paradigm at the building level. The professional organizations have or are in the process of developing curriculum and evaluation standards. Congress has just passed legislation that will provide money for implementation of the Goals 2000 Educational America Act (P.L. 103-227). Teachers and their instructional procedures must use a curriculum alignment process in order to infuse the goals and standards into daily instruction.

The curriculum planner or the district curriculum committee must align the teaching and learning experiences which will properly order the teaching and learning experiences. Mastery teaching, usually associated with the work of Benjamin Bloom and John Block, calls for a cycle of pre-test at the start of the unit, teach the unit, and then post-test for learning change. Next, the teacher provides extending and refining experiences for those who have mastered the content while reteaching is provided for those who have not. Needless to say, all of this is a tall order when the teacher has many students and the process is one provided manually by paper and pencil test, hand-scoring, and recording progress on a wall chart or in the grade book. Obviously, a microcomputer based curriculum management system is required.
Previous research at Iowa State University has developed a methodology for curriculum renewal, alignment, and curriculum driven testing (Manatt & Stow, 1986; Manatt & Holzman, 1991). This methodology has resulted in detailed curriculum guides for all subjects, all grade levels, kindergarten through twelve. There is a need for a way to bridge from an existing curriculum to this more robust scope and sequence containing a detailed array of learner outcomes coupled with carefully piloted assessment items. The present investigation was conceived as an experiment to determine how to bridge from the existing SIM process and product (curriculum renewal and curriculum driven assessment) quickly and inexpensively, but with the requisite faculty ownership. In addition, the bridge was developed to overcome the nationwide tendency to think a better job could be done by simply adding test items from some item bank. The bridge directs the attention of the user in order to see the linkage and user learner outcome/code number/bridge and not just a bunch of test items that are added to the curriculum. This study also brings together a synthesis of current literature on mastery teaching and mastery learning, effective assessment practices, and computer management systems.

Several issues were raised by the Gilbert teachers during this project. One issue was raised when four and five foil response patterns were used in the same unit test. Although "not given" was either the fourth or fifth foil, the switching from four to five back to four foils could not be demonstrated as distracting in student responses. It would seem logical, though, not to mix the number of foils within a test, but to remain consistent with one pattern in order to reduce the ambiguity for
students when choosing an answer and when filling in the bubbles on a scan form. The more extraneous variables contained in a test, the less accurate the resulting measure is likely to be.

Another issue concerned determining mastery levels. The curriculum committees decided that the teachers should expect 80 percent of the students to master 80 percent of the learning. A problem arises when there are three questions for a learner outcome; is mastery achieved when two questions are answered correctly or must all three be answered correctly? The teachers desire to keep the unit tests under 50 questions. They are considering going to two tests allowing five questions for each objective. This researcher encouraged the staff to use a series of short (possibly 10 to 15 questions) formative tests measuring two or three objectives instead of end-of-unit tests that measure multiple objectives. If needed, the formative tests could then be compiled to give an overall mastery level for the unit.

If the Gilbert teachers truly want to implement mastery learning, they must begin implementing segmented testing. With the computer management system in place, formative test results could provide same-day feedback to teachers and students. Formative tests rely on item response patterns in terms of mastery or non-mastery for their validity as criterion-referenced measures. Formative tests provide students and teachers with feedback information as the learner moves through the unit (Bloom, 1971). This knowledge of results increases learning for both the student and the teacher (Gagné, 1963; Fuchs et al., 1984, 1991, 1992; Wang, Haertel, & Walberg, 1993). There are three assumptions to mastery
learning: 1) instruction is segmented into separate skills which are arranged hierarchically according to difficulty (taxonomy), 2) teachers engage in teach/formative test/corrective activities/formative test instructional cycle, and 3) students are given time needed to learn a skill before progressing to the next skill (Bloom, 1968).

The Gilbert teachers were extremely positive. There was a positive school climate that encouraged educators to develop new methods of instruction, the teachers were superior educators, they were supported by an extremely competent principal, and the school had exemplary school board support.

The traditional assessment mode continues to be end-of-year norm-referenced testing. The academic progress of students generally involves two strands. First is the year-to-year progress checks that necessitates student assessment at each grade level. Second is the progress monitored during the school year, which is usually limited to teacher-made quizzes and tests given within the classroom. Stevens and Grymes (1993), in their research titled Opportunity to Learn, discovered that the preferred mode is norm-referenced testing followed by criterion-referenced testing in the 91 public school districts studied nationwide. However, most districts relied on end-of-year assessment information to make decisions about student progress. Less than one-fourth of the public school districts used interval or segmented testing (pp. 33-34). It would be interesting to know if the schools using that model of assessment also had a computer management system that provided the feedback data.
A summative test was administered the week of March 14-18 and covered concepts taught since the beginning of the school year. The Standard Item Analysis was used to determine the test reliability, which proved to be quite high for the fifth grade (KR-20=92, mean=86.83, standard deviation=10.41) and sixth grade (KR-20=85, mean=87.69, standard deviation=7.42) test. When comparing the curve of the students' scores on these two tests with the curve of Bloom's Optimal Instruction (Figure 5), the similarity of the J-shaped curve is quite clear. Optimal instruction occurred and optimal learning was achieved for 90 percent of the students in each grade on material that had been taught over a seven-month period.

Recommendations for Practice

The results of this study point to several suggestions for teachers, administrators, and superintendents.

1. Once a district has completed curriculum renewal and curriculum alignment, the bridging document becomes useful when attempting to match a second curriculum for the purpose of adopting learner outcomes and/or test items. The bridge forces better learner outcomes before test items are selected. The document needs to include a column for indicating the match, or lack of, with the standards written by the professional organizations. This ensures adoption of these standards into teaching practices.

2. The school or district should make several decisions before adopting a specific management system or none at all. First, what is needed from a computer management system? (a) Must it be "user friendly"
so that teachers will access it frequently or will a technician manage the system? (b) Will it be a shell for entering and managing the curriculum or merely a test generator? (c) Will the system allow the user to recall individual learner outcomes and test items connected to it from the item bank? (d) Is it possible to revise program goals without revising the entire hierarchical structure? Most do not allow this. (e) Are there sufficient fields for hierarchical coding? (f) Does it operate by utilizing a relational data base? (h) Will it accommodate test items with graphics?

Second, review management systems after the criteria and the needs have been well established. Base the final decision on extensive research and not on a sales person's enthusiasm. Contact other schools or districts using the system being considered to get their perspective.

Finally, select the hardware that is compatible with the software instead of following the common practice of selecting the computer system first then deciding on the software to run it. This will eliminate the necessity of modifying the school's needs to the structure of the hardware.

3. If a school or district should decide to adopt curriculum-driven assessment by first conducting a pilot project, it is important that all staff be involved and kept informed of both successes and problems. This will provide the necessary support for full implementation later.

4. When selecting assessment items, only valid and discriminating items should be used. Therefore, it is important when adding items to a test item pool where formative assessment items will be drawn that all
items be pilot tested to determine item validity and discrimination power before use.

5. Both the principal and the fifth and sixth grade teachers devoted many hours past the duty day to ensure the success of this project. School districts should be encouraged to compensate educators for the extra time devoted towards transforming schools. It should be noted that the process was very interesting and engaging for the teachers. And the very process of going through the bridging and computer basing forced the teachers to be even more committed.

Recommendations for Research

The present investigation was conceived as an experiment to determine how to bridge from the existing SIM process and product (curriculum renewal, scope and sequence, and curriculum driven assessment) quickly and inexpensively, but with faculty ownership. Recommendations for further research include:

1. The intent of this study was to provide the impetus for furthering mastery teaching and mastery learning and high impact teaching. More research needs to be done on how a teacher uses correctives and enrichments in mastery learning. Central to the theory is the concept of formative or segmented learning assessment. Further research is needed to ascertain how to move formative assessment to all subjects and all grades. Such research could be conducted in other districts or in the current district, since only the elementary school participated in this project.
2. The possibility of transferring the current bridging document to the microcomputer should be explored. This would not only expand its use but also provide access to larger groups of educators.

3. The current School Improvement Model team possesses a great deal of experience in pre- and post-tests to determine gain scores. It would be highly desirable to explore the possibility of applying that expertise to furthering mastery teaching by using gain scores to motivate students and teachers.

4. Further research is needed to develop the process for segmented testing using summative test items with a larger population. Specifically, identifying valid and discriminating items is currently done at the expense of teaching time.
BIBLIOGRAPHY


Stow, S. B. *Alternative assessment of student performance.* School Improvement Model, Iowa State University, Ames, IA.

Stow, S. B. *Alternative assessment.* School Improvement Model, Iowa State University, Ames, IA.

Stow, S. B. *Samples of alternative assessment techniques.* School Improvement Model, Iowa State University, Ames, IA.


APPENDIX A.

SEQUENCE OF EVENTS AS REPORTED IN THE DIARY, AND DIARY
Table 19. Sequence of events as reported in the diary

<table>
<thead>
<tr>
<th>Date</th>
<th>Time(^a)</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 8, 1992</td>
<td></td>
<td>Gilbert principal interested in developing a joint project with Iowa State University.</td>
</tr>
<tr>
<td>October 28, 1992</td>
<td>3:15</td>
<td>Meet with staff to present &quot;Joint-Project&quot; Proposal.</td>
</tr>
<tr>
<td>March 4, 1993</td>
<td>4:00</td>
<td>District level meeting held.</td>
</tr>
<tr>
<td>March 19, 1993</td>
<td></td>
<td>Gilbert Elementary staff agrees to proposal.</td>
</tr>
<tr>
<td>March 25, 1993</td>
<td>2:00</td>
<td>Dates set for staff development.</td>
</tr>
<tr>
<td>March 26, 1993</td>
<td></td>
<td>Contract signed confirming six workshops.</td>
</tr>
<tr>
<td>April 21, 1993</td>
<td>12:00</td>
<td>Met with the fifth and sixth grade teachers to explain math test to be given in May.</td>
</tr>
<tr>
<td>May 10-14, 1993</td>
<td></td>
<td>Fifth and sixth grade teachers administer math test.</td>
</tr>
<tr>
<td>June 2, 1993</td>
<td>3:15</td>
<td>Results of math test shared with the staff.</td>
</tr>
<tr>
<td>September 13, 1993</td>
<td>8:30 a.m.</td>
<td>First meeting with National Computer Systems (NCS) in Minneapolis, MN.</td>
</tr>
<tr>
<td>September 16, 1993</td>
<td>3:15</td>
<td>Meeting with fifth and sixth grade teachers involved in the project.</td>
</tr>
<tr>
<td>October 4, 1993</td>
<td></td>
<td>Partnership between Gilbert, Iowa State University, College of Education, and National Computer Systems announced.</td>
</tr>
</tbody>
</table>

\(^a\)Note: All times are in the afternoons except where stated otherwise.
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 5, 1993</td>
<td>5:30</td>
<td>Iowa State University College of Education and Ames Chamber of Commerce Open House.</td>
</tr>
<tr>
<td>October 6, 1993</td>
<td>3:15</td>
<td>Bob Duff, NCS Sales Representative, makes a presentation to the Gilbert staff.</td>
</tr>
<tr>
<td>October 11, 1993</td>
<td>7:00</td>
<td>Present details of project to Gilbert School Board.</td>
</tr>
<tr>
<td>October 12, 1993</td>
<td>9:00 a.m.</td>
<td>Began entering fifth grade math curriculum using Performance Plus™ (NCS).</td>
</tr>
<tr>
<td>October 18, 1993</td>
<td>6:00</td>
<td>Presented details of project to the District School Improvement Team.</td>
</tr>
<tr>
<td>November 17, 1993</td>
<td>9:00 a.m.</td>
<td>Second meeting with NCS in Minneapolis.</td>
</tr>
<tr>
<td>November 30, 1993</td>
<td></td>
<td>Invited Iowa Department of Education to review partnership.</td>
</tr>
<tr>
<td>November 30, 1993</td>
<td>2:30</td>
<td>Begin application for a federal grant to fund the Gilbert project.</td>
</tr>
<tr>
<td>December 2, 1993</td>
<td>9:00 a.m.</td>
<td>Assisted sixth grade teachers with writing math test items.</td>
</tr>
<tr>
<td>December 2, 1993</td>
<td>2:30</td>
<td>Gilbert staff meets to review progress made on project.</td>
</tr>
<tr>
<td>December 8, 1993</td>
<td>2:30</td>
<td>Decision on mastery levels and management system hierarchy. Brainstorming gain/benefits to having a management system for teacher use.</td>
</tr>
<tr>
<td>December 16, 1993</td>
<td>8:30 a.m.</td>
<td>Assisted fifth grade teachers with writing math test items.</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Activity</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>December 16, 1993</td>
<td>3:00</td>
<td>Prepare the application for a $70,000 federal grant.</td>
</tr>
<tr>
<td>December 31, 1993</td>
<td>1:30</td>
<td>Met with the newspaper reporter for The Daily Tribune to discuss the project.</td>
</tr>
<tr>
<td>January 3, 1994</td>
<td>8:30 a.m.</td>
<td>Final preparation of grant proposal.</td>
</tr>
<tr>
<td>January 4, 1994</td>
<td>10:30 a.m.</td>
<td>Reporter for The Daily Tribune visited Gilbert Elementary School for a &quot;photo-op.&quot;</td>
</tr>
<tr>
<td>January 5, 1994</td>
<td>11:00 a.m.</td>
<td>Mailed the grant proposal to Washington, D.C.</td>
</tr>
<tr>
<td>January 10, 1994</td>
<td></td>
<td>Request submitted to Iowa State University requesting scholarships for the Gilbert Project.</td>
</tr>
<tr>
<td>January 13, 1994</td>
<td>9:30</td>
<td>Conference call with Dick Manatt, Luba Lewytzkyj, and Richard Dyckes to discuss the partnership.</td>
</tr>
<tr>
<td>February 1, 1994</td>
<td></td>
<td>The fifth grade teachers are concerned with the low scores on a recent unit test.</td>
</tr>
<tr>
<td>February 3, 1994</td>
<td>7:00</td>
<td>Katy Rice (school board member) presented Gilbert's vision of school transformation as part of a Phi Delta Kappa panel discussion.</td>
</tr>
<tr>
<td>February 10, 1994</td>
<td>3:30</td>
<td>Brainstorming session for the F.I.N.E. grant proposal.</td>
</tr>
<tr>
<td>March 1, 1994</td>
<td>3:05</td>
<td>Met with the sixth grade teachers to develop their 100-item summative test.</td>
</tr>
<tr>
<td>March 3, 1994</td>
<td>3:05</td>
<td>Met with the fifth grade teachers to write their 100-item test.</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Activity</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>March 15, 1994</td>
<td></td>
<td>The College of Education agreed to fund miscellaneous expenses related to the June seminar and grant 2 units of credit to attendees.</td>
</tr>
<tr>
<td>March 28, 1994</td>
<td></td>
<td>NCS was requested to fund a social for the participants in the seminar: Teachers as Leaders in Standards Driven Reform (Ed Adm. 615).</td>
</tr>
<tr>
<td>April 4, 1994</td>
<td>6:30 a.m.</td>
<td>Meeting with Gilbert principal and fifth/sixth grade teachers to go over the summative test results.</td>
</tr>
<tr>
<td>April 7, 1994</td>
<td></td>
<td>NCS decides to provide scholarships for the Gilbert teachers participating in the June seminar.</td>
</tr>
<tr>
<td>April 20, 1994</td>
<td>3:00</td>
<td>Professor Manatt reviews the course outline for the 11 Gilbert teachers participating in the June seminar.</td>
</tr>
<tr>
<td>April 21, 1994</td>
<td>2:00</td>
<td>Met in the Dean's conference room for planning session for June seminar.</td>
</tr>
<tr>
<td>May 6, 1994</td>
<td>1:30</td>
<td>Planning session for the June seminar, same room.</td>
</tr>
</tbody>
</table>
There was a great deal of communication and preliminary work done by Dr. Dick Manatt, Mr. Dave Ashby, Ms. Katy Rice, and this researcher before the first entry in this diary and the date the staff decided to work on the "Joint Project". The first contact with Mr. Dave Ashby, principal of Gilbert Elementary School, and Ms. Katy Rice, Gilbert School Board member, was on September 8, 1992. It was then, that they indicated an interest in working with the School Improvement Model Projects (SIM) at Iowa State University (ISU) on the goals being developed by the elementary school teachers and administration. It was that interest that lead to the activities delineated in this diary. This long term effort is best understood by also reading the background communication materials and meeting minutes in the appendix.

October 28, 1992 (3:15 - 4:15 PM)
• Dr. Manatt presented a "Joint-Project" Proposal to the Gilbert Elementary School Faculty and the School Improvement Model Team at Iowa State University. The staff was asked to consider the proposal, but were not expected to make a commitment at that time.

March 4, 1993 (4:00 - 5:15 PM)
• Met with the superintendent, two school board members, one fifth and one sixth grade teacher to present the proposal to form a partnership between Gilbert Elementary and the School Improvement Model Projects (SIM) at Iowa State University (ISU). Minutes of that meeting can be found in the appendix.
March 19, 1993
• All the elementary school teachers agreed to participate in the project. See Mr. Ashby’s facsimile (FAX), same date, in the appendix.

March 25, 1993 (2:00 - 4:00 PM)
• Dick Manatt, Dave Ashby, and Ralph Woodward set dates for staff development which will provide a foundation for further curriculum and test development. The six workshops are to be conducted after school, except for one early release day. They will be provided at no cost to the district.

• The dates and topics are as follows:

<table>
<thead>
<tr>
<th>DAY</th>
<th>DATE</th>
<th>TIME</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday, March 31</td>
<td>3:00 - 4:30</td>
<td></td>
<td>Keynote: Curriculum Improvement and Assessment</td>
</tr>
<tr>
<td>Thursday, April 8</td>
<td>3:30 - 4:30</td>
<td></td>
<td>A Comparison: SIM Steps and Your Curriculum</td>
</tr>
<tr>
<td>Thursday, May 6</td>
<td>3:30 - 4:30</td>
<td></td>
<td>The Gilbert Assessment Project; Why Do It?</td>
</tr>
<tr>
<td>Wednesday, May 12</td>
<td>3:00 - 4:30</td>
<td></td>
<td>Writing and Critiquing Test Items</td>
</tr>
<tr>
<td>Wednesday, May 19</td>
<td>2:30 - 4:30</td>
<td></td>
<td>Use of Measurement for Classroom and School Improvement</td>
</tr>
<tr>
<td>Wednesday, May 26</td>
<td>3:30 - 4:30</td>
<td></td>
<td>Critiquing CRM’s: How To Do It</td>
</tr>
</tbody>
</table>

March 26, 1993
• The contract confirming the six workshops was signed by Dave Ashby and Dick Manatt. The contract is needed to formalize the agreement between SIM and Gilbert Elementary School.
April 21, 1993 (12:00 - 12:30)
• Met with the fifth and sixth grade math teachers to review the test booklet developed by SIM's client districts. All questions were answered. The test is to be given during the week of May 10 - 14. It was stressed that no test is to be given to a child not returning a permission slip signed by a parent or guardian. Please see the appendix for the memorandum to Dr. Manatt, letter to Doug Williams, letter to the 5th and 6th grade teachers, and the letter to the parents.

May 10 - 14, 1993
• Fifth and sixth grade teachers administered SIM's summative test to get a "feel" for how their students would do on a validated criterion referenced test. It also gave the teachers and opportunity to work with the tests developed by SIM. The tests (bubble sheets) were scanned and scored by the ISU computer center.
• Several items in both tests assessed areas not covered by the current math curriculum.

June 2, 1993 (3:00 - 4:00 PM)
• The fifth and sixth grade teachers agreed to share the results with the entire staff. This allowed everyone an opportunity to work with a printout.
• Dr. Manatt assisted with the interpretation of the student results.
• The teachers were quite pleased with the performance of the students who took the tests.

September 13, 1993 (8:30 AM - 4:00 PM)
• First meeting with National Computer Systems Corporation at their headquarters in Minneapolis, MN. The purpose of the meeting was to explore and define a partnership between NCS, SIM, and Gilbert Elementary School.
• See minutes of the meeting in the appendix.
September 16, 1993 (3:15 - 4:00)

- Meeting with the sixth and fifth grade teachers involved with the pilot.
  - We began discussing test items and test item banks. The teachers were under the impression that since they were to have access to SIM's test item bank, all they would need to do was type in an objective and the test items "would just pop up". I stated that the software was not compatible, so the test items would still need to be selected according to their curriculum objectives then entered into Performance Plus for access (I hope the statement on compatibility was correct). They were also confused as to their need to write test items, since banks were available to them. I commented that since not all of SIM's student outcomes had test items already written, there would be a need to write test items for those skills. The teachers' concern seemed to be with the time required for writing test items. Dave stated he could arrange for time during the day for that purpose. Towards the end of the conversation, they appeared to understand the need to write items for their formative tests and seemed willing to do so if given release time.
  - Dave reiterated his previously stated goals and added that if they could write a formative test for the two grades and pilot it by the end of the semester, they would have made a lot of progress.

October 4, 1993

- The partnership writes a press release announcing the action research project. The press release will be used when meeting with the general public.

October 5, 1993 (5:30 - 7:00 PM)

- Iowa State University College of Education and Ames Chamber of Commerce Open House.
  - A booth with the mission statement of the partnership, examples of activities undertaken so far, and Performance Plus software from National Computer
Systems (NCS) was shared with the community. This was our first publicity regarding the Gilbert Elementary School project.

- Present were Luba Lewytzkyj, Senior Market Manager for NCS, Bob Duff, NCS Sales representative, Dick Manatt from Educational Administration, Dave Ashby principal, Gilbert Elementary School, and Ralph Woodward: graduate student and primary researcher.

- The goal of the exhibit was to provide:
  - an overview of curriculum renewal and alignment by SIM aided by the Performance Plus software.
  - an explanation of criterion-referenced measures (criterion-referenced tests and authentic assessments).
  - a demonstration of scoring and reporting student assessments using the NCS 3000 optical scanner, an IBM-clone PC, and a printer; and
  - an explanation of how and why this three-way partner was formed.

- Comments made by attendees indicated a great deal of interest in the project and provided positive feedback regarding the initiative.

October 6, 1993 (3:15 - 4:00)

- Mr. Bob Duff, Sales Representative, spoke to the Gilbert faculty regarding the following topics:
  - Performance Plus™ is user friendly and will support the staff’s desire to implement interval of segmented testing for mastery learning and mastery teaching.
  - it is permissible to use test items from adopted or other texts since test items are not copyrighted but not whole tests since they are copyrighted.
• it is important to note test items adapted from other item banks, such as Assure™, in order to give credit if the school district ever decides to share/sell the tests the staff develops.
• as Dr. Manatt said, parents want to know how their child is doing against their own ability, doing against the competition, and the likelihood of future success.

• Staff comments:
  • The teachers have decided that October 15th will be the deadline for 5th/6th grade to make their first formative test.
  • When will we have access to the SIM test items? Once the proposal is presented to the Gilbert School Board.
  • Should students with IEP’s be included in the testing? Yes, so long as it does not conflict with their educational plan. Remember, you will be able to desegregate the test data (SES, race, gender, etc.) to determine how the different groups of your student population are doing. The key words here are Equity and Equality

October 11, 1993 (7:00 - 9:00 PM)
• Met with the Gilbert District Board of Education to explain what had transpired up to this point and explain the partnership.
• Dr. Manatt presented the following:
  A wise old man once said when presenting a speech, “Tell them what you are going to tell them, tell them, then tell them what you told them.”

I. I am going to tell you:

  1. There was a revolution in learning psychology 20 years ago. We discovered how the brain works in cognitive learning.
2. Cognitive learning is nothing more than learning concepts. Skills are another type of learning but all learning starts out with concepts.

3. Computers got small, cheap, and showed up at the work site.

4. Keeping track of student's learning is too complex for the grade book method used by teachers - - let alone 30 to 150 students.

5. Assessment drives instruction. Students only study what the teacher mentions in class - - forget the books on reserve in the library, if it is not mentioned in class the students will not read it.

6. The right kind of assessment is called Curriculum Aligned Testing. The typical Arizona District will have curriculum aligned testing by the year 2003.

7. The Gilbert School District will have it now - - not 10 years from now - - and our partnership will bring it about.

II. Tell them:

A metaphor is a figure of speech when one term is used to describe a different object or condition such as "evening of life" for an old duff like me. Or a "ringing bell" to stand for the pain of a headache.

1. Old metaphor for learning: "school as a factory - - the business of learning was adaptive, learning controlled by decline and events outside the learner." The learning was seen as the recipient moving through an assembly line of classrooms while the teacher's role was to give information in "chunks";

   • Since 1970, new metaphors have come about: "The focus of learning is the learner - - successful learning is internal to the individual." And "The mind is an information processing system."

This new understanding tells us much about how we should create curriculum, teaching, and assess student performance. What does this tell us?

   • Shift away from rote memorization of isolated parts.
   • Now, instruction should enable students to construct meaning by linking new
information to prior knowledge.

- Connect school learning to real world tasks and issues.
- Students must get actively involved with content, question premises, apply information to new examples and situations.
- Students learn how to learn by developing a set of cognitive stringers (the curriculum plan helps).
- Student's learning needs depth not breadth. Read the original book, not Cliffs Notes; read the constitution not a comic book about the founding fathers; do not do 22 repetitions of a math exercise if they get it the second time.
- Right now there is generally a poor match between what is taught and what is tested in the way standardized testing is conducted.
- Standardized tests are insensitive to instructional efforts and to an individual student problems.
- We need curriculum aligned testing, a very well defined scope that is breadth - - what to include, what to leave out, - - sequence and scope. To do that Sue Beers and her people spend days scanning and shifting - - at the same time the SIM Project has been doing that in seven districts; in Minnesota, Wyoming, Florida, Iowa, Arizona, and now Kansas.
  - What does the academic society recommend?
  - What does the state require?
  - What spirals (repeats) in the curriculum?

We need interval or segmented testing so both the teacher and the learner knows what went right, with what went wrong, and what to do next. Feedback - - knowledge of results not just dry theories.

Knowledge of results imparts volition; trying harder, very carefully paying attention, meeting dead lines, self-restraint, and endurance. This curriculum has to be designed with the right sequence of concept and skills and it has to have what is the
appropriate age, grade, and time to introduce teaching sequence of concepts - - skills that
must be earmarked for "planned" abandonment because we can not retain everything in
K-6 or K-12. When Gilbert and our previous client districts got done writing curriculum,
it was too complex to put in the grade book.

2. This is where, the computer and our partners software, Performance Plus,
comes in. You can be sloppy with a manual system - - but you can not be sloppy with a
computerized system. Performance Plus - - is like a spreadsheet. A spreadsheet holds
your formative data - - but you have to generate the data bits and you have to put it in
right.

• Performance Plus is a package for the curriculum you have planned - - enhanced
by cross checking against what we have been demonstrating wide for 17 years; 3
years at a time in district after district.

• Performance Plus holds your curriculum in learner outcome form, what must the
student do - - the teachers have specified that.

• Performance Plus - - hooked to these teaching and learning instructions are test
items to measure the success of the student in learning the concept.

3. The package keeps track and makes reports for each student, section, all of a
teachers section, and the whole school, - - and it is immediately available to the teacher -
- not just once a year from Iowa City.

4. Assessment drives instruction or standards - - driven right $\Delta$ results $\implies$ OBE

5. We can have it now; reasons:
   a) SIM groundwork
   b) your curriculum work
   c) a partnership from business who trusts us to be the pioneers of
curriculum aligned testing.
III. Tell you what I told you:

Why: Your faculty - Ralph/SIM/NCS, matching Performance Plus™ to your technology of micro computers, etc.

What: Your system piloted math 5th and 6th grade.

When: School year 1993 - 94.

When: Next school year all K - 6 math?

How: The following figure explains the interrelationship of the partnership:

<table>
<thead>
<tr>
<th>SIM</th>
<th>Gilbert</th>
<th>NCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• How to</td>
<td>• Time</td>
<td>• Software</td>
</tr>
<tr>
<td>• Scantron</td>
<td>• Students</td>
<td>• Technical</td>
</tr>
<tr>
<td>• Curriculum/tests</td>
<td>• Teachers</td>
<td>Support</td>
</tr>
<tr>
<td>• Form Models</td>
<td>• Ideas</td>
<td>• Future Needs</td>
</tr>
</tbody>
</table>

October 12, 1993 (9:00 AM - 3:30 PM)

• Dave Ashby and I began entering the fifth grade math curriculum into Performance Plus™ and found that:
  • the teachers had written some outcomes with no objectives tied to them.
  • we had to give a great deal of thought to the hierarchy of the code that was chosen since once entered, it is a protected field. In order to change a code the entire hierarchy needs to be retyped, including the goal statements and student objectives.
  • once the math curriculum was typed (three times due to revisions on the hierarchy) and given to the teachers for proofing/approval, they decided that the outcomes needed to follow the sequence of the text book being used. In order to accommodate the teachers, the entire curriculum had to be re-entered.
  • Because of these experiences, we found the structure of the software limiting.
NCS has indicated that the new software being developed will alleviate many of these problems.

October 18, 1993 (6:00 - 7:30)

- District School Improvement Team; topic Graduation Expectations
  - The District needs to decide what kind of information it can use or wants?
  - What do the students, teachers, administrators, school board, and parents need to know regarding student achievement?
  - Regarding affective areas that the Religious Right has objected to; “Provide an environment in which these are likely to happen but students are not evaluated on”.
  - Some examples might include:
    - working collaboratively
    - productive workers
    - community contributors
    - adaptable problem-solvers/critical thinkers
    - self-sufficient individuals

November 17, 1993 (9:00 AM - 3:00 PM)

- Second meeting with National Computer Systems Corporation at their forms making plant. The goal was to refine the partnership and delineate the responsibilities of each member.
- See minutes of the meeting in the appendix.
November 23, 1993
• Because of the Gilbert Elementary School Project, Katy Rice (Gilbert District School Board Member) submitted an application for membership in The Partnership for Change to Joe Millard, Education Service Division, Heartland Area Education Agency 11.
• This is an organization dedicated to the transformation of school programs in order to provide more effective schools for students.
• The Partnership for Change is a consortium of public schools within AEA 11 and universities or colleges that are interested in sharing “information, exploring alternatives, and confronting challenges and issues in a manner that promotes collegiality and trust” (see Partnership for Change Guidelines in the appendix).

November 30, 1993
• Katy Rice requested assistance from Ted Stilwell, Interim Director Iowa Department of Education, for support from his office for both suggestions and sharing the Gilbert project accomplishments so far state-wide.

November 30, 1993 (2:30 - 4:00 PM)
• Building Level Team; Sharing Department of Education Federal Grant Information.
Title: F.I.R.S.T. Schools and Teachers/School-Level Projects.

• Absolute priority:
  • 1. grant has to originate from Gilbert Elementary School. ISU will assist with the writing.
  • 2. the proposal must demonstrate how it will provide opportunity for teacher improvement.

• Competitive Priority:
  • demonstrates the benefits to students.
  • demonstrate increased access for all students to a quality education.
• demonstrate how measurable progress toward specific goals of improved educational performance will be made.

• Points that need to be stressed:
  • Gilbert is a good Iowa school.
  • It is a small district.
  • Cost per pupil is $4,480.

• The goal is to provide an environment for teacher lead educational improvement.
  • How knowledge of results acts as an incentive for improvement in achievement (parents, students, and teachers).

• If the Federal Grant is approved, the school would have the money to align all subject areas and write test items within three years.

• Individual test items can not be validated one at a time. They must be combined into a larger test for validation. Once validated, then the test items can be included in other test forms.

December 2, 1993 (9:00 - 11:30 am) and (3:15 - 4:30 PM)

• In the morning I worked with Mike Korf and Donna Holtan writing multiple choice test items for unit five in sixth grade math.
  • Three questions were written for each outcome for a total of 37 questions. Samples were taken from text books (Scott Foresman), other test publishers (Project Assure), or created by the teachers.
  • The teachers noticed that some of the outcomes did not match the objectives that they had written earlier in the year.
  • When writing the four foils, a great deal of care was given to rotating the correct answers between A, B, C, and D so as not to establish a predictable pattern.
  • Much thought was also given to the incorrect answers in order to better
determine the students thought process if they chose a particular answer. The comment was made that teachers do not frequently do this. Such care in selection would help in the reteaching efforts.

- The form for writing test questions helped focus on the technique for writing questions.

- Afternoon meeting with Mike Korf and Donna Holtan (sixth grade teachers).
  - Mike spoke to the staff yesterday regarding the partnership and what the goals were. He was upset by some of the comments of the staff regarding the speed with which the partnership is moving.
  - SIM and NCS can move much faster than the teachers (education) "...because that is their job." "Education/teachers move at a slower pace than the partnership because their main goal/priority is teaching students." "Teachers need more training, resources, and time for reflection."

- Any time people, including teachers, are involved in significant change, they tend to resist the change.

- The school needs to write their goals, not just discuss them.
  - By the year 2,000: a management system will be in place.
    - a computer terminal will be in each classroom.
    - there will be increased collaboration among teachers.

- Some of the staff view:
  - the project as just one more thing
  - believed that the project would involve only 5/6 grade math, not all subjects
  - they do not feel that they were part of the decision to include all subjects
  - feel as though the partnership was thrust upon them

- "You do not need to be a principal to make decisions."
• There seems to be a fine line between overwhelming the staff with too much information and not giving them enough. I suggested that a binder be kept in the office or staff room with notes and minutes from meetings that teachers could view at their convenience.

• Mike sees the advantages of the project as:
  • helping focus on student achievement.
  • data driven reporting to parents, students, and teachers.
  • a management system that will save time in the long term.

December 8, 1993 (2:30 - 4:00)

Agenda: Dave spoke about the software; specifically mastery levels and the management system hierarchy.

Mike reviewed the process and the decisions made during the past two years so that the teachers realize the progress that has been made and how the partnership evolved. He will lead the brainstorming session.

• Dave explained some of the difficulty in using Performance Plus™. The software is programmed in two separate parts. One part is the management system and the other is the test generator. He could not find in the users guide how to connect between the two parts. The NCS programmer was called and the response was, “Oh, yea, that’s not in the manual.”

• Dave presented the following diagram to explain the hierarchy as it is currently being used by the school.

• He asked that the teachers decide what the mastery level was to be used since this had implications for the number of test items used to determine it i.e. two out of three or four out of five for 80% mastery.
Several questions at each objective

- One teacher suggested that the taxonomy level be tied to the outcome and not the objective. There are two concerns here: (1) by tying the taxonomy to the outcome then all of the objectives have to be at that level of difficulty and (2) by doing so the compatibility between what SIM has established in their coding system and the Gilbert system will be compromised.

- Mike reviewed for the staff:
  - the goals for the school that were decided on
  - the mission statement
• and the decision to alter the schedule to give teachers time to make decisions for planning.

• Regarding the partnership; teachers must trust in the leadership and decisions of the Building Level Team since they place a priority on the staffs and school’s interests.

• Mike sees the advantages of the partnership as providing college credit for training, time to write test items, and the progress that has been made up to this time could not have been made without its assistance.

• Mike next asked the staff to brainstorm what they think the gain/benefits are to having a management system in place for teachers, parents, and students. These comments are to be forwarded to Dr. Manatt for inclusion in the grant proposal. Their ideas:

**Teachers**
- precise analysis and reporting of student achievement
- saves a great deal of time checking and analyzing assessments
- ability to generate multiple forms of tests
- quicker and more accurate feedback, assists reteaching, diagnostic
- clear expectations
- data based decisions
- increased student achievement

**Parents**
- quicker and more accurate feedback to students (success breeds success)
- clear expectations
- increased student achievement

**Students**
- quicker and more accurate feedback to parents
- clear expectations
- increased student achievement

- Mike explained that ISU and/or NCS would be paying the tuition for the 2 hours of credit teachers would receive for attending the June 6 - 10 invitational workshop being given by Dr. Manatt. (NOTE: The teachers need to submit all courses taken to the district by September 15 for a salary adjustment.) He also explained the August 8 - 12 workshop and that teachers would be paid an hourly rate decided on by the group. The teachers were then asked what they would consider as incentives for working on the project. Their responses (some outside of SIM’s control):

  - college graduate credit (ISU)
  - pay for substitutes
  - August 8 - 12 workshop, $20 per hour
  - working in an air-conditioned room
  - a typist
  - to write tests, $400- $399 (this brought much laughter since this what the stores do all the time) Dave explained that if the price was too high, fewer people would have a chance to work.
  - food
  - when school is not in session, provide child care for the parents with children
  - career advancement - opportunity to train others
  - recognition; school board, community, articles in journals, State?
  - additional days in teacher contract to accomplish work
  - early dismissal for teacher work time
  - retroactive pay for June 6 - 10
  - college credit applied to lane changes
  - teacher recognition for test items created when published
December 16, 1993 (8:30 - 12:00)

• Assisted Dorothy Rust and Mary Stratton with writing test items for 5th grade, chapter five in their text (Scott Foresman). The problems all involved division of whole numbers.

• Both teachers spent much time not only in selecting the test items, but also on the foils containing the incorrect answers. "These will tell us what the child is not understanding which will help us with reteaching. The tests we use now don't help us with that."

• The teachers wanted to know if there is a need for five questions to validly assess the mastery of an objective accurately?

December 16, 1993 (3:00 - 4:00)

• Present Doug Williams, Dave Ashby, Dr. Manatt, Ralph Woodward.

• Dr. Manatt needs information to assist the district in completing the F.I.R.S.T. Schools and Teachers/School-level Projects. This is a Federal Grant offered by the Department of Education. The district is applying for $70,000 to complete the elementary school's educational transformation.

• Doug Williams agreed to write a letter regarding Human Subjects Release for the student testing that will occur later in the term. Ralph will provide samples.

• "Teachers will get a perception of teaching they have never had before [this project]." - Dave Ashby.

• The grant is due in Washington DC by January 7, 1994.

• The Department of Education anticipates that awards will be announced by May 6, 1994.

December 31, 1993 (1:30 - 2:30)

• Dave Ashby and Katy Rice met with a reporter from The Daily Tribune to try to get some publicity for the Gilbert project. The reporter felt that it would make a good story and promised to print it.
January 3, 1994 (8:30 - 11:00)
• Dr. Manatt, Dave Ashby, and Ralph Woodward met to discuss the progress made on the Federal Grant and decided on how to divide up the tasks that remain. Dr. Manatt continued on the proposal narrative, Dave completed the disaggregation of student data and derived the figures for the budget, Ralph used these figures to complete Form 424A (Budget Information), drafted a letter of support for Mr. Jamie Vollmer (Director of Operations for the Iowa Business, Labor and Education Roundtable), and wrote an abstract explaining the rational and the proposal. The abstract and the budget information were to be facsimiled (FAX) to Mr. Vollmer and Mr. Steve McCann (Division of Community Progress Iowa Department of Economic Development) by the next day.

January 4, 1994 (10:30 - 11:30)
• The reporter for The Daily Tribune visited Gilbert Elementary School to take pictures to go along with the newspaper article. Please see the article in the appendix.

January 5, 1994 (11:00 AM)
• The grant proposal was sent by registered mail to Washington. We are supposed to receive the acceptance or denial notice regarding the proposal by May 6, 1994.

January 10, 1994
• A request for “courtesy scholarships” for the Gilbert Elementary School staff participating in the June 6 - 10, 1994 workshop was submitted to Les Sternberg, Associate Dean College of Education. The request was for $290 (two graduate credit hours) for each of the ten participating teachers.

January 13, 1994 (9:30 - 11:30)
• Conference call was made between Luba Lewytzkyj, Richard Dyckes, and Dick Manatt. National Computer Systems agreed to partially subsidize the cost of the tuition for the June course.
The fifth grade teachers were displeased with the results of the unit test they had written on their own. Many students performed less than expected with few attaining mastery of the material. Both teachers were quick to blame themselves for not having taught the material adequately. Mr. Ashby and I believed the problem lay elsewhere, perhaps in the format of the question.

The scanner was tested and proved to be in working order. The bubble sheets were checked to determine if they were mis-marked. This proved not to be the problem either. While reviewing the test booklets, it became evident that mixing four foils and five foils could be a confounding factor as was the selection “not given” for some of the questions. Mr. Ashby and I hand-scored each student test to determine if these two factors were too much of a distractor for the students. The following illustrates what was found when the test booklets were hand-scored. The foil “not given” proved to be a disproportionate distractor that, when chosen, provided no relevant data regarding the students thought process. Although “not given” was either the fourth or fifth foil, the switching from four to five back to four foils could not be demonstrated as distracting in student responses. It would seem logical, though, not to mix the number of foils within a test but to remain consistent with one pattern in order to reduce the ambiguity for students.

<table>
<thead>
<tr>
<th></th>
<th>Class 1</th>
<th>Class 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marked “not given” incorrectly.</td>
<td>87</td>
<td>78</td>
</tr>
<tr>
<td>Did not mark “not given” and should have.</td>
<td>34</td>
<td>15</td>
</tr>
<tr>
<td>Incorrect Answer.</td>
<td>66</td>
<td>36</td>
</tr>
<tr>
<td>Possibly guessed (no work shown).</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Marked the correct answer in the booklet but marked the incorrect bubble.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Marked answer “E” when there was none.</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
- Teacher reaction: "This is really discouraging. I taught this unit really well. Although I'm committed and don't really want to [go back]. I mean we have to go on; the old way was less stressful. My class did better [then]."

February 3, 1994 (7:00 - 9:00)
- Katy Rice, Gilbert School Board member, presented the board's vision of school transformation as part of a Phi Delta Kappa panel discussion. Her discussion centered around the following flow chart. The title of the program was, School Transformation: Changing America's Schools.

February 10, 1994 (3:30 - 5:15)
- Dick Manatt, Dave Ashby, Katy Rice, Francis Kayona, and I had a brainstorming session to gather ideas for the F.I.N.E. (First in the Nation in Education) grant proposal.
- The group developed a flow chart that follows. It illustrates how all of the ideas fit together.

March 1, 1994 (3:05 - 7:30)
- I met with the sixth grade teachers to write the summative test. It took approximately five hours for two sixth grade teachers and I to select 100 test items. The source, page number, and the problem number were recorded and given to me. I then spent two ten hour days typing the items, the key, and proof reading both. Copies were given to the teachers for additional proof reading.
VISION
TO MAKE GILBERT COMMUNITY SCHOOL DISTRICT A WORLD CLASS DISTRICT WHICH WILL BE USED AS A MODEL FOR OTHER SCHOOLS STATE AND NATIONWIDE.

LONG-TERM GOAL
TO IMPROVE THE QUALITY OF TEACHING AND LEARNING STEADILY OVER TIME

BUILDING GOAL
TO IMPLEMENT AN INSTRUCTIONAL MANAGEMENT SYSTEM TO MONITOR STUDENT PROGRESS AND GUIDE INSTRUCTION

BOARD GOAL
TO ESTABLISH PARTNERSHIP(S) WITH BUSINESS, HIGHER EDUCATION, AND/OR OTHER ORGANIZATIONS TO ASSIST THE DISTRICT IN ATTAINING QUALITY TEACHING AND LEARNING

ACCOUNTABILITY
REPORT PROGRESS TO CONSTITUENTS

ACTION PLAN
STEP ONE: COLLABORATE WITH RESOURCES TO GATHER DATA

ACTION PLAN
STEP TWO: PRESENT IDEA OF PARTNERSHIP TO OUTSIDE ORGANIZATION(S).

ACTION PLAN
STEP THREE: ENTER INTO PARTNERSHIP

ACTION PLAN
STEP FOUR: CREATE MISSION STATEMENT, GOALS, AND OBJECTIVES FOR THE PARTNERSHIP

ACTION PLAN
STEP FIVE: ESTABLISH THE GAME PLAN AND INITIATE IMPLEMENTATION

ACTION PLAN
STEP SIX: CONSISTENT COMMUNICATION BETWEEN PARTNERS REGARDING PROGRESS

Katy Rice
Gilbert Board Member
Figure: 1 DEVELOPING AND TESTING A STANDARDS AND PERFORMANCE ASSESSMENT MODEL OF SCHOOL TRANSFORMATION

VISION
TO BECOME A WORLD CLASS SCHOOL THROUGH MEETING NATIONAL EDUCATIONAL GOALS #2 and #3

LONG-TERM GOAL
TO TRANSFORM K-6 INSTRUCTION

GILBERT BUILDING GOAL
TO IMPLEMENT AN INSTRUCTIONAL MANAGEMENT SYSTEM TO MONITOR STUDENT PROGRESS AND GUIDE INSTRUCTION

PARTNERSHIP
GILBERT SCHOOL DISTRICT/COLLEGE OF EDUCATION/NATIONAL COMPUTER SYSTEMS

SUPPORT FROM BOARD OF EDUCATION

ACTION PLAN #1
STRATEGIC PLANNING

ACTION PLAN #3
ANALYZE MATH STANDARDS & ARTICULATE WITH DISTRICT LEARNER OUTCOMES/DEVELOP NEEDS ASSESSMENT

ACTION PLAN #5
CONDUCT EXPERIMENT OF INSTRUCTIONAL DELIVERY/REPORTS

ACTION PLAN #6
COMPLETE STAKEHOLDERS' INTERVIEWS/PRODUCE HANDBOOK AND EXAMPLES

ACTION PLAN #7
PREPARE FINAL F.I.N.E REPORT

ACTION PLAN #2
TRAINING OF TEACHER LEADERS

ACTION PLAN #4
COMPUTERIZE ASSESSMENT AND CURRICULUM STANDARDS

SUPPORT FROM F.I.N.E.
March 3, 1994 (3:05 - 4:50)

- The same procedure was followed with one fifth and one sixth grade teacher (one of the fifth grade teachers was absent, so a sixth grade teacher volunteered to assist). Since the one teacher had already gone through the process, everything seemed to move more quickly.
- Again the source, page number, and the problem number were recorded and given to this researcher who typed the test, the key, and proofread both. In this case the selection process took a little over one hour and forty-five minutes.
- Since both groups of teachers had previously spent a great deal of time reviewing and writing the mathematics curriculum, they knew the goals and learner outcomes extremely well so the bridging document was not used in these two situations. If the teachers had not known their curriculum so thoroughly, this would not have been the case.

March 15, 1994

- The College of Education agreed to fund miscellaneous expenses related to the June seminar and grant 2 units of credit to the attendees. Additional information can be found in Appendix B.

March 28, 1994

- NCS was invited to host a social the evening before the June seminar begins. They have agreed to do so. Richard Dykes (Director of Educational Testing) and Bob Duff (Sales Representative) will set up a display and introduce NCS personnel. Additional information can be found in Appendix B.

April 4, 1994 (6:30 - 7:45)

- A breakfast meeting was held at the Country Kitchen with Mr. Ashby, Donna Holtan, Mike Korf, Dorthy Rust, Mary Stratton, Dick Manatt, and I. The results of the standard
item analysis of the summative test was explained. Questions were answered as they arose.

April 7, 1994

• NCS has agreed to provide scholarships for all the Gilbert teachers participating in the June seminar. Additional information can be found in Appendix B.

April 20, 1994 (3:00 - 3:45)

• Professor Manatt reviewed the course outline and requirements for the eleven Gilbert teachers participating in the June seminar. Registration forms were passed out and questions answered.

April 21, 1994 (2:00 - 4:30)

• A meeting was held in the Dean's conference room to work on the outline for the June seminar. Present were Dave Ashby, Francis Kayona, Dick Manatt, Shirley Stow, Katy Rice, Dave Putz, Doug Williams, and I. Tasks were assigned and to be completed by the next meeting.

May 6, 1994 (1:30 - 3:00)

• This was the final planning session for the seminar. Progress reports were presented by all present. Modifications to the Workshop Planner were made. Please see Appendix B for the finalized copy.
APPENDIX B.

HISTORICAL REVIEW OF THE PROCESS BETWEEN GILBERT ELEMENTARY SCHOOL, THE SCHOOL IMPROVEMENT MODEL (SIM), AND NATIONAL COMPUTER SYSTEMS CORPORATION
Please forward this note to Katie Rice.

TO: DICK MANATT:
Sue Beers and Dave Ashby have discussed Gilbert Elementary School's needs. Below please find specifications for an instructional management system with room for Manatt et al to comment. (This is what we are looking for...does your proposal fit?)

Two fold purpose:
1. To track student progress in achieving identified district, course, and grade level outcomes.
2. To monitor the district curriculum in terms of student achievement.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides a question bank of valid items?</td>
<td>Yes, custom-tailored for Gilbert Public Schools, K-6 or K-12</td>
</tr>
<tr>
<td>Assessment items match district outcomes?</td>
<td>That is part of our research design—perhaps the most important part!</td>
</tr>
<tr>
<td>Ability to track student achievement by outcome on a K-12 basis?</td>
<td>Yes</td>
</tr>
<tr>
<td>Reports group progress?</td>
<td>Yes</td>
</tr>
<tr>
<td>Periodic reporting of student progress as frequently as needed?</td>
<td>That will be the dissertation problem for Mr. Ralph Woodward, a member of the ISU team</td>
</tr>
<tr>
<td>Easy to use/user friendly?</td>
<td>Dave—Here and in several other questions you have inferred that we are preparing a software package. We are not. We are preparing what goes in the package shell.</td>
</tr>
<tr>
<td>Generates a variety of individual reports on student progress?</td>
<td>Yes, but it varies by package you choose. We are looking at 17 different possible programs.</td>
</tr>
<tr>
<td>Reports are easy to understand</td>
<td>What we will do for you based on ISU mainframe is. What you buy later to score in your building may not be.</td>
</tr>
</tbody>
</table>
and read?  

Why? Because many are PC based!

Compares progress to other students?  

Yes

Accommodates a variety of assessment formats?  

CRT and authentic

Modifiable for the future?  

Most packages for PC or Mac have limited capacity

Training available for staff on how to use it?  

Yes, I will personally provide.

Ability to generate assessments and tests?  

The best packages (e.g., "Abacus") do.

Ability to create local test items?  

Yes

Test item analysis available?  

Yes

Technical support available?  

Yes

SOME QUESTIONS  
Cost to implement?  

Need some keyboard hourly help and meetings with your teachers.

On-going costs?  

10c/student/subject until you get a package to replace our mainframe scoring.

Teacher time needed?  

Five days to get curriculum and tests ready.

Hardware needed?  

Document scanner, PC, and printer. If you buy some packages, they (vendor) will scan in test items and art work.
Support staff needed? In a comparable district (Thermopolis, Wyoming) a 1/2-time secretary serves entire district (100 teachers)

Dave--

We're very excited about this opportunity to work together. We now can do everything for summative pre- and posttesting for 8000 kids as far away as Key West, Florida.

Now we want to

1. Make the tests for Gilbert (hooked to your curriculum)

2. Operate for a year or two with a Wylbur terminal at your office to ISU mainframe.

3. Help you make the transition to in-school scoring and reporting.

Cheers!

c: Mrs. Rice
**TO:** Mr. David Ashby  
**WORKSHOP CONFIRMATION**  
**DATE:** 9-21-92  

**TO:** Principal, Gilbert Elementary School  
**109 Rothmoor Drive**  
**Gilbert, IA**  
**50105**  

**FROM:** Richard P. Manatt, Director, SIM  
**E005 Lagomarcino Hall**  
**Iowa State University**  
**Ames, Iowa 50011**  

Telephone: Office: 515/294-5521  
Home: 515/232-0202  

This is to confirm your recent request for a SIM Presentation. Please double check the following arrangements and contact me at once if there is any misunderstanding.

**CONSULTANT?** Dick Manatt  
**HOME TELEPHONE:** 232-0202  

**WHEN** Wednesday, October 28, 1992  
**3:15-4:15**  

**LOCATION?** Elementary Building  
**Gilbert Building**  
**City**  
**State**  

**TOPIC** Introduction to Multi-Assessment For Iowa and Gilbert Outcomes

**CONCERNS?**  
A "Joint-Project" Proposal  
Gilbert Elementary School Faculty and the School Improvement Model Team

**FOR WHOM?** Total Staff (Approximately 35)

**COSTS** N/A

**PAYMENT?** N/A

**FOR REQUESTING ORGANIZATION:**  
**FOR SIM:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Consultant's Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dick Manatt</td>
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<table>
<thead>
<tr>
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<td></td>
<td>9-24-92</td>
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Manatt et al / Gilbert Elementary School

Cooperative Student/Program Evaluation Project

What Gilbert Elementary wants:

A functional system to evaluate programs and student progress. The school wants to know if it is headed in the right direction, and what needs to be changed. What is there to demonstrate that program goals have been reached and student progress is what it should be?

What Gilbert Elementary has to offer:

Caring high quality professional staff interested in change and improvement
Teachers have all received Madeline Hunter Training Level 1
Some teachers and all administrators have received Madeline Hunter Level 1 and 2
Established curriculum development process with majority of course and unit outcomes in place
Renewed Services (special ed.) in place with established building assistance team and other attributes of RSDS
School district has established a school transformation team (School Improvement)
  Participated in year long school improvement program with Drake University
  Sends about 10 people to the Okoboji conference each year
  School mission statement has been established
  Graduation outcomes are in process (outcomes & skills developed and nearing final stages
  School Improvement team now focusing on matching graduation outcomes to course and unit outcomes
Board of Education commitment to general and technology improvement
Just getting started with the Amoeba project
Joint inservice project with Boone, Gilbert, and United Community (year long project) with Bill Rauhauser
  Building Leadership teams established
  Pre-school meeting, early dismissals, and release time for BLT
Whole Language (Integrated Language) implemented in elementary building after training with Jan Keese and a year long course with Dr. Henney of Iowa State (they threw out grammar!)
Teachers are ready to abandon letter grades for outcome reporting
Teachers do not like ITBS because of lack of congruency with what is taught
Convenient location for ISU

Concerns:
How to match evaluation assessments with course and unit outcomes?
How to collect data without too much disruption and loss of time?
How to manage and track the data by student, grade level, and by building?
How to report results to students, parents, and teachers in a usable format?
The purpose of the meeting was to determine in what ways the School Improvement Models Project could assist Gilbert Elementary School achieve its' educational goals. The school is a kindergarten through sixth grade school with approximately 380 students.

Topics discussed:

• Gilber's goal is to have a totally managed outcomes based education curriculum system matching outcomes, goals, and testing with a reporting system capable of monitoring student, class, and district progress. The software needs to be user-friendly so that teachers will utilize it. Abacus Instructional Management System (AIMS) by Abacus Educational Systems is currently being reviewed to determine if it meets their criteria.

• Gilbert has done some matching to stated outcomes and has developed authentic assessments for them. Mastery learning will be in place within five years.

• The district is currently working on two sources of funding: local bond issue and a grant from The New Schools Development Corporation. The suspense for the proposal is October 30, 1992. Also discussed was the possibility of using the testing and evaluation resources at Iowa State University as an interim step.

• Gilbert is a member of The Group For Change.

• Doug Meinhard of EduQuest in Des Moines will be making a presentational the elementary school on October 21 at 2 PM for the entire staff.
Dick:

Interesting turn of events. At Wednesday's teachers' meeting we discussed the draft of the graduation outcomes developed by our school transformation team. We really got hung up on the items that related to ethics and values. One problem was how to assess, measure, or evaluate them. There is quite a controversy in some schools where fundamentalist groups are seeing such things as America 2000 or even environmental education as some sort of a conspiracy. The teachers were virtually paranoid to be held accountable for things that parents might question whether the school should teach them at all. All of the teachers felt that there are things that are ethically wrong and we are obliged to instruct students accordingly, but they had visions of great turmoil should the school make decisions on what is right and wrong and hold the teachers accountable.

The teachers requested that the report on graduation outcomes to the District Advisory Committee be post-poned until there was further discussion on these issues. We should have suspected this, because the Transformation Team spent several hours on the same issues. It is quite a dilemma. The teachers feel there are many societal wrongs that could only be corrected through education while at the same time they are afraid to take the responsibility. They look one way and see anarchy and mob rule and they look the other way and see themselves being burned at the stake.

I would suggest that your group not go too far with the graduation outcomes for a while. The teachers received the draft of the state outcomes at same meeting. Those outcomes may help the modification and blending process and help put the teachers more at ease.

I have Ashby
Gilbert Community School District
Staff Beliefs

WE Believe:

- everyone can learn;
- a strong family unit is the basis for a healthy society;
- hard work deserves to be rewarded;
- all individuals have a right to exist in an environment that stimulates learning;
- everyone needs time and space;
- all people have a need to communicate;
- success brings success;
- everyone needs to be treated with respect;
- there is value in life other than money;
- everyone needs a feeling of positive self-worth;
- diverse accomplishments, cultures, and people enrich the community;
- everyone needs love;
- education is a responsibility shared by the student, home, school, and community;
- high expectations are necessary to achieve excellence;
- educated citizens are essential for a democratic society; and
- positive role models enhance learning.

October 29, 1992
These Belief Statements will be presented to the Board on November 9.

If you have any comments you wish to share concerning the beliefs, please talk to Tom, LaVonne, Sue L, or Mike K. by Wednesday.
Dick: Here are some of the responses to the two questions I asked. There may be more. Ralph and I are meeting next Monday to get things started.

Ashby

What is your perception of Dr. Manatt's proposal and how do you feel it relates to our outcome based managing and evaluation goals?

I really enjoyed his presentation and I am excited about being involved in it.

I think his proposal is exciting and definitely in the direction that I would like to go. He seems very committed to making this a success.

I am excited about the proposal for I see it as helping us put to use the goals and objectives we have worked on for curriculum projects. Since we have done all this work on goals and objectives, let's give Mr. Manatt a try.

Seems to be compatible with the direction we are moving.

I feel OBE is a necessity in our schools. Any plan which will implement OBE, Mastery Learning and an evaluation program to coincide would be highly effective. I have seen this type of program work in other schools (Dallas Center-Grimes) and I'm aware of its effectiveness.

What are your concerns or questions about the project (time, money, appropriateness, complexity, lack of information, etc.)?

Time and money. But these are always concerns and I think we need to go with it anyway.

Time and money are concerns, but I don't feel like I have much control over those factors. I would hope that the outcomes we have been writing for years would be included in the bank of assessment items. Actually, I think that we have appropriate outcomes. We just need people willing to consult with us in developing criterion referenced measures.

Collaboration is the key.

No concerns right now. I feel that we will work on the project in June and August for one week each and we will get paid. More questions as they come up.

Do we need to do all course areas or could we experiment with just one?

I'm concerned about the amount of time we will need to spend setting this up! We don't have spare time now...where will it come from?

Will we have to do without other things to implement this?
Will these people in any way critique my teaching?

My only concern is the amount of time which will be needed to do a "quality" job. Also I feel all staff members need to be proponents of this system in order for it to be beneficial across the curriculum.

I would like to see more details of what actually will be happening.
Members Present:  Dave Ashby, Principal  
                       Sue Beers, Curriculum Coordinator, Roland/Story  
                       Ralph Woodward, Graduate Student and Researcher

This was an informational meeting to review both the SIM materials and the materials already developed by the Gilbert staff. Although the coordinator was helpful in retrieving material for review, she appeared to have reservation regarding the proposed project to meet the schools' stated needs.

Tasks for Ralph:

1. send the review of software to Dave;
2. call Dave regarding the next meeting with Dr. Manatt, Sue, Dave, and me;
3. bring goals for the Gilbert/SIM project and a simplified written explanation of the components of the SIM model.
Meeting
January 22, 1993
7 - 8:30 AM

Present:  Dave Ashby, Gilbert Elementary School Principal
         Katy Rice, Gilbert School District Board Member
         Ralph Woodward, Graduate Student and Researcher

The intent of the meeting was to take the broad picture and break it down into smaller pieces to clarify and provide general understanding of the project. Presenting the project to the superintendent will be the next step in seeking district support.

Topics Discussed:
• Ralph's dissertation will focus on the feasibility of matching Gilbert's curriculum objectives with the SIM Model and State Mandated Objectives.

• Katy provided a sample grid to show how the match-up might be demonstrated between Gilbert's curriculum objectives and the SIM Model. For the purpose of staff ownership, Dave suggested that having his teachers actually do the match in math would be a valuable exercise once the sample is finalized.

• The pre and post printouts from Saydel were reviewed as a sample possibility of what could be provided as a service to Gilbert, pending their final decision on which platform to utilize for data management.

• The next meeting will be scheduled after Katie and Ralph meet with Dr. Manatt and Dave meets with Sue Beers.

Tasks To Accomplish:
Katy: - continue developing a draft of the sample grid.
Dave: - contact Sue Beers regarding the proposal (approved by the Gilbert teachers, and actively sought by Dave).
Ralph: - provide Dave with the Test Item Development Form used by SIM.
        - finalize a sample matching grid that demonstrates the match between Gilbert's curriculum and the SIM model curriculum.
<table>
<thead>
<tr>
<th>CURRICULUM COMPONENT</th>
<th>CURRICULUM COMPONENT</th>
<th>SIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GILBERT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURRICULUM COMPONENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIM</td>
<td></td>
<td></td>
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<tr>
<td>SIXTH GRADE MATH</td>
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<tr>
<td>196</td>
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</tbody>
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**CHAPTER 3: DECIMALS: ADDITION AND SUBTRACTION**

**MAJOR OBJECTIVES:**
- The learner will be introduced to decimals through hundred thousandths.
- **PROGRAM GOAL:**
  - **#4:** To perform the operation and use the properties of addition with real numbers.
    - **ITEMS:** 11, 12
    - **SKILL:** 4.02c
  - **STRAND: SUBTRACTION**
  - **#6:** To perform the operation and use the properties of subtraction with real numbers.
    - **ITEMS:** 16, 17
    - **SKILL:** 6.02c

**MASTERY:**
- Addition of decimals;
- Understanding hundredths.

**LEVEL OF LEARNING:** Mastery

**BLOOMS' TAXONOMY:** Application

**EVALUATION METHODS**

**STUDENT OUTCOMES**

**LEARNER OUTCOME**

**THE LEARNER WILL:**
1. Read, write, compare, and order decimals.
2. Round decimals and estimate their sums and differences.
3. Add and subtract decimals.
4. Solve word problems using the five-point checklist.

**THE LEARNER WILL:**
- Add decimals to hundred thousandths.
- Subtract decimals to hundred thousands.
TO: Katie Rice
RE: ISU/Gilbert Elementary School Cooperative Project

STATUS QUO

In place:

1. Most Gilbert Elementary teachers have had training in mastery learning and many follow mastery learning principles.

2. There has been extensive training in and implementation of cooperative learning and integrated language.

3. Many unit, course, and grade level outcomes have already been established.

4. First and second grades have already implemented a check list type report card which is a list of expected outcomes for those grades.

5. Third grade will have their card ready for next year.

6. Fourth, Fifth, and Sixth grade teachers feel very strongly that the time has come to eliminate the traditional letter grades in favor of an outcome based reporting system.

7. ITBS does a fine job of giving us a norm reference to about 50% of what we do. We have no yardstick for the rest of it.

8. Graduation outcomes have been established (mostly with regard to what a graduate should be like, not an academic accomplishment list). Academic accomplishment is in the course and grade outcomes.

9. There is a general feeling that we need to decide where we will focus our efforts for the future.

10. Ralph, Katie, and Dave have already met and begun the process of narrowing the focus to something manageable.
Concerns:
1. Everyone, Gilbert Elementary teachers, Dave Ashby, Katie Rice, Dick Manatt, Ralph Woodward, or whoever may involved in this project is already working to the "max" and a lot of students benefit from that effort. A lot of really fine work is being done by a lot of really fine people, but the new expectations (do more with less) seem to be punitive rather than incentive. Time is as precious as money.

2. The towers of yellow Jello in Des Moines are now, because of special interest pressure, doing an about face on graduation outcomes. Teachers now dare not say that a child is a good worker or not a good worker, for example, because that is a value judgment. What does this turn of events do to a system designed for outcome expectations?

3. We must start with a manageable project that will show some real results. Even the discussion about some system swooping in and shaking up people already at the edge of the performance envelope seems to be overwhelming. A single CPU system, a scanner (this much hardware may be within Gilbert budget capabilities), a half dozen committed teachers, and a whole bunch of help from ISU could get something viable going.

4. Existing student assessments now come mostly from textbook sources. A few are teacher created. Gilbert Elementary teachers need skills in selecting appropriate assessments and a mechanism/format/platform on which to do it.

5. Gilbert's Transformation Team is floundering. The coming "about face" of the Governor and legislature broke a leg off of our table and it is about to tip over. This project is within the scope of a Transformation Team's charge of school improvement and they have only heard it mentioned a couple of times. A presentation to this Team may be appropriate when we have something to present. A meeting with Dick Manatt, Doug Williams, Ralph Woodward, Dave Ashby, and Katie Rice would be desirable before going before the Transformation Team (now called the School Improvement Team since "Transformation" is a word from the pit of hell, according to the groups fighting against whatever "New Age" is).
6. If we had $50,000 cash available we would have a management system in place, a networked station in every classroom, and be well into the process of entering data. That kind of financial support is two to three years away and dependent upon a successful bond election. ISU and minimum local financial support is our only hope at this time.

7. Sue Beers' concern is that we will extend considerable effort getting started on one system and then later we will have to completely rebuild again to fit some future management system. Ashby does not share that concern because the coding, for example, should not be system dependent anyway. The assessment items or the outcomes would be the same on any system.

I hope these comments are helpful.

Dave Ashby
TO: The Gilbert Team
FROM: Dick Manatt
RE: Project Rationale
DATE: February 26, 1993

The Gilbert Public School District, in common with several forward-looking districts in Iowa, is presently moving forward with school-based management and building level teams with the intent of maximizing student achievement. Simultaneously, the District has worked hard and long to renew and align curriculum content and sequence with the goal of establishing outcomes which will be consistent with the forthcoming Iowa Outcomes and Standards. The District has succeeded to a remarkable extent to do the curriculum "remake" and make the shift to participative management.

The next step is to embed teacher empowerment so thoroughly as to enable the faculty to break away from traditional isolated subject instruction to help students, all students, master the subject content and make meaningful connections across various fields of study.

Empowerment is key to changing schools enough so that major improvement in achievement is possible. Empowerment implies having the capabilities as well as the permission to create change.

The School Improvement Model (SIM), an action research team center at the College of Education at Iowa State University, has facilitated the same curriculum renewal and school-based management activities for districts in Minnesota, Wyoming, Arizona, Florida, Pennsylvania, and Iowa since 1978. SIM has gone one level beyond the present status of the Gilbert district's curriculum/outcomes and school-based management to include criterion-referenced and non-traditional assessment coupled with the curriculum.

This component allows teachers, students, parents, and the district’s management team to know precisely how much each student can know and do at the start of a course and the end of a course. We have these pre-and post-tests available for all subjects K-12 excluding the vocational subjects. We want to share these materials, capabilities, and procedures with the district.

In return, we propose a joint venture whereby the district and SIM will work together, one subject at a time, to create a series of steps to quickly assist other Iowa districts to move forward from the curriculum plan and teacher empowerment to an assessment package of (1) criterion-referenced pre- and post-
measures [which we now have] and (2) continuous measures to be used throughout each course to facilitate (a) clinical diagnosis of student learning needs, (b) mastery teaching and (c) progress reporting for students and parents in a much more meaningful way than report cards.

It is the movement from one test at the beginning and one test at the end of the course to a continuous set of measures that is our ultimate goal.

The first task, however, is to discover the small, sequential steps that an outside facilitator (SIM) and teachers within a school (in the case of Gilbert selected elementary mathematics teachers) need to follow to link their existing curriculum to the extensive sets of learner outcomes and tests that SIM has created.

We have arranged this to be the dissertation of Mr. Ralph Woodward who will do most of the hard work. The tasks for Gilbert personnel are primarily examining, reflecting, and deciding. The SIM/Gilbert project has been deliberately kept small and thus manageable.

Moreover, we will carefully hold the participants together as they (1) avoid the pitfalls of the challenge from the religious right concerning their beliefs that secular humanism and the "New Age Curriculum" are secretly being infused in public schools' efforts to establish outcomes-based education, mastery learning and transformation; (2) avoid needless duplication as the district moves its curriculum management and assessment to the computer system of choice. That is precisely the purpose of this project and one of the major research questions to answer.

We look forward to a mutually beneficial endeavor. Thanks for listening to our ideas!

RPM: dm
As we struggle to get around the barriers of lack of time and lack of funding, we are looking at narrowing or redifining the scope of the project to something that is workable within present means. The search for funding will, of course, continue. The Gilbert Board of Education has contracted with Dale Foreman to investigate funding sources. Other avenues will be explored.

We have limited expertise on what would be feasible for a dissertation, so all our ideas are subject to being shot down in flames. Below is a proposal that may have some workable aspects in spite of the restraints. It is a result of communication among Katie Rice, Sue Beers, and Dave Ashby.

Three beginning assumptions:

1. SIM/Manatt assessment items are validated nation wide.

2. Gilbert has two kinds of items:
   A. Assessments developed by textbook vendors (most are these)
   B. Some assessments are created by Gilbert teachers.

3. None of the assessment items is validated to Gilbert Elementary curriculum

The proposal has three parts (one for each participant).

Part I Ralph's New Study (this is Ralph's job)

"A Comparison of Validity Among Assessment Items From Three Sources"

Null Hypothesis: There is no significant difference among assessment items that are nationally researched, developed by textbook vendors, or local teacher developed with regard to validity, reliability, etc.

Items in study could be tagged S for SIM, T for Textbook vendor, and G for Gilbert elementary.

Part II Teach the experimental group of Gilbert teachers how to write and/or choose valid items. (This is Dick's job)
Part III Link assessment items to Gilbert graduation, state, course, and unit outcomes. (This is the Gilbert teachers' job (forms for doing this are attached))

This focus removes Gilbert teachers' apprehension about the high stakes pre and post tests. The focus becomes one of developing quality assessments rather than evaluation. If tracking of student progress is not a part of the effort at this time, then the matching of assessments to outcomes can easily be managed on a flat database with reasonable power. A relational or linking type of data storage becomes necessary when student progress is to be tracked and reported. When we get to the that point, there are several software options available. At that point we don't need to "reinvent the wheel."

The SIM model focuses on system or group evaluation. This proposal is taking a small part (the assessments), gets Gilbert teachers started (on something they need to do anyway), somewhere in there may be a research topic for Ralph, and begins a collaborative relationship between Gilbert Elementary and Iowa State. Whether it is too far away from where we might have been going needs to be discussed.

A data gathering device for teacher use might look like this:

CURRICULUM ALIGNMENT WORKSHEET

Course/Grade Level Outcome

Linkages: Graduation Outcome #_________ State Outcome #_________

Subject ___________ Grade Level _______ Outcome # _______

Bloom's Taxonomy Level ___________ Expected Mastery Level ________%

ASSESSMENT ITEMS:

1. ________________________________________________________________

2. ________________________________________________________________

3. ________________________________________________________________

etc.
Later on the worksheet would include:
Lists of activities and resources
Comments to parents if not mastered
etc.
A data base printout of the worksheet might look something like this:

<table>
<thead>
<tr>
<th>CODE</th>
<th>ASSESSMENT ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-9-Sci-3-22</td>
<td>The green color in plants is ________________________</td>
</tr>
<tr>
<td>13-9-Sci-3-22</td>
<td>Plants create food by a process called _______________</td>
</tr>
<tr>
<td></td>
<td>etc.</td>
</tr>
</tbody>
</table>

Later the results of the test would be tied to a student file that tracks progress.

<table>
<thead>
<tr>
<th>CODE</th>
<th>STUDENT NAME</th>
<th>MASTERYLEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-9-Sci-3-22</td>
<td>Katie Rice</td>
<td>Not taught (or Mastered, or 72%)</td>
</tr>
</tbody>
</table>

The computer generates the code from the entry form. Printouts print either the complete outcome or an abbreviated version, not the outcome code. The code is for the computer only.
AGENDA

1. Introductions

2. Phase I

   Background information - Mr. Ashby
   
   a) School curricular needs
   b) Staff support
   c) Collaborative work with the school improvement model (SIM)
   d) Goal of the project

   Relationship of SIM Model and the needs of Gilbert - Ralph Woodward
   
   a) Sixth grade mathematics matching
   b) Format Explanation (Curricular Pyramid)

3. Phase II

   Curriculum renewal/development & criterion-referenced measures - Dr. Manatt
   
   a) What Gilbert has already accomplished
   b) Gilbert's next task

4. Phase III

   Training of teachers & district staff

5. Final Comments & Questions
Meeting
March 4, 1993
4 - 5:15 PM

Minutes

Members Present: Doug Williams, Superintendent
Dave Ashby, Principal
Char Hulsebus, School Board President
Katy Rice, School Board Member
Mike Korf, Sixth Grade Teacher
Dorothy Rust, Fifth Grade Teacher
Dick Manatt, SIM Director
Ralph Woodward, Graduate Student and Researcher

• Each school has a building level team that works on the transformation of schools.

• The district team has developed two long term goals:

  • in order to instill collaboration in each school, restructure the school day within
  5 years to allow that to happen.

  • by the year 2000 (in 7 years) the district will have some type of management
  system to report progress to both students and parents.

  • the primary report card has already been revised to reflect a move in that
direction.

• The two main concerns in reaching these goals are:

  • How can this be done with limited finances?

  • How is high stakes testing going to be managed?

  • Dr. Manatt suggested that using the current tests as a pre/post measures
    would help highlight student gains and minimize the high stakes issue.

  • The district might find it helpful to track student mastery before deciding
    on the percentage of level of mastery for each student; doing so would
    prove less frustrating and provide a more realistic or attainable goal for
    the district.

  • One of the goals of the project is to develop continuous (Formative)
testing, providing a more accurate picture of student learning.
• The SIM/Gilbert project is being kept to small initial steps for ease of management. It will also provide the pattern for the subsequent development of the other curricular areas.

• The Gilbert teachers have had training in mastery learning and cooperative learning. According to Mike Korf the teachers are ready for innovation in both teaching strategies and the structure of the school day. They are ready for change and are looking for process.

• Reviewing the Curriculum Renewal/Development Guide, the Gilbert teachers have already completed steps 1 - 6 through their standard curriculum revision cycles (at least math, language arts, reading, and social studies) and should be able to start at step 7 (the training of test developers).

• When making a comparison between sixth grade math objectives developed by Gilbert and those developed by SIM, there is a very close match. There is no need to rewrite the curriculum!

• Based on the information and the materials SIM is willing to provided, the Gilbert Team needs to decide what is appropriate for their needs.

• Considering that Spring Break falls next week, it is hoped that teachers can be selected and work begun on the project starting the week of 22 March at the latest.

• The following materials were provided and discussed:
  • Dr. Manatt's memorandum to the Gilbert Team
  • Critiquing Criterion-Referenced Measures
  • Criterion-Referenced Testing for Outcomes-Based Education (Manatt, Holzman, 1991)
  • News Media Release
  • Curriculum Renewal/Development and Criterion-referenced Measures (Estimated for One Year)
  • A sample comparison of the Gilbert and SIM curriculum match in Sixth Grade Math.
  • The SIM Advantages
TO: RALPH WOODWARD, ISU
FROM: DAVE ASHBY, GILBERT ELEM.
RE: SUMMARY OF MEETING

We met with Dr. Manatt and Ralph Woodward at 4:00 last evening. One of the purposes of the meeting was to bring the Board of Education members and the superintendent up to speed on what we are proposing. The second purpose was to hear about the redefined proposal. Katie Rice and I have been communicating with Ralph and Dr. Manatt about what would be realistic and feasible to undertake. Our discussions centered around several items:

a. Gilbert elementary teachers do not need to be trained in mastery learning.
   b. Curriculum development has been an on-going process and elementary staff does not need to start at square one.
   c. Many objectives, outcomes, instructional guides, etc. are already in place
   d. Gilbert elementary teachers are not satisfied with ITBS as being the most important measure of student learning.
   e. Gilbert elementary teachers wish to be able to communicate what students know, what they don't know, and how they compare. They feel it is time for letter grades to go
   f. No cultural or attitude change process is needed. The teachers are ready to move on, they just do not see how to do it within the constraints of time and money.
   g. If "High stakes" pre and post testing is the only significant change, Gilbert elementary teachers will be very nervous.
   h. What's in it for us? What's in it for Iowa State? What is our real commitment?

Those attending the meeting felt that both purposes were achieved. The superintendent and the Board of Education members are "on board" and supportive. The re-defined proposal addressed the discussion points above.

Dr. Manatt gave us a copy of the SIM (School Improvement Model) 16 step model (copy attached). It was decided that our appropriate entry level would be at step 7 (training of test developers). All the previous steps are in place. Dr. Manatt will make available to us SIM's huge bank of validated, reliable test items and provide us free training in how to match instruction and objectives.

It is important to note here that Dr. Manatt stressed that he wants Gilbert teachers to have complete freedom in their assessment design. He is so confident in the assessments they have developed over 15 years, in both the training teachers will get, and the results that will be reported that he is happy to let teachers use either existing assessments or pick and choose from SIM's. He is sure you will soon "see the light." The same goes for pre and post-testing. If some teachers choose to test unit by unit or whatever he is amenable to that. He is quite confident that when teachers start to see "real" gain scores and when they realize how the quality, validity, and reliability of assessment procedures have improved he will have yet another group of "true believers."

We also decided that we will focus on math (the easiest subject with which to start). Ralph has already done some studying of the SIM assessments and Gilbert
Elementary's math objectives and he has found that they match closely. This removes one of the possible snags. We will not have to re-design curriculum.

Continuing the emphasis on flexibility it was decided that a few teachers or all the teachers could participate. The study could be done with one grade, all the grades, or anything in between. This is the next step in the process. We need to know how many teachers are interested in participating. I have promised to give them this information within two weeks.

In response to the intentions of this collaborative project, I will do my best to purchase two microcomputer units. One will be a Macintosh and the other an IBM clone. This will give us the flexibility to use whatever computerized management system we decide upon and will provide us the capability to interface with the ISU/SIM system. These systems will also provide us with teacher word processing etc. capabilities.

As with anything we do that brings about significant change do not dream that someone is handing you a pretty package which will solve all your life's problems with no involvement from you. This project will require commitment. Hopefully, what we learn and what we gain will offset the time and work it takes. I see this collaborative project as a "jump start" or a "hand-up" to something we want to do anyway.

Please talk to Mike Korf, Dorothy Rust, or me if you have further questions. Then think seriously about your participation. We need to let Ralph and Dr. Manatt know soon. They are anxious to get started.
1. In an earlier bulletin, I mentioned the brag video. If there are things at the elementary that we wish to stress, I really need an indication of interest. I will follow through on ideas, content, and help out wherever I can, but I need to hear of any particular interest.

2. Myrna Wiggums is still looking for a 1st session this fall student teacher in 4, 5, or 6. If I don't get any takers by the end of the week, I will let her know that she will have to look elsewhere. Mr. Jelsma did volunteer, but she had already assigned one to him.

3. Monday morning we could not find four of the Appleworks disks (3.5 inch size). We have more of these disks in the building than we have GS computers on which to use them (making any more goes beyond the limits of our license). If they are put away after use there should always be enough. The best way to assure the presence of the full set of 14 for the lab is to have teachers check them out and teachers return them. Students may tend to treat them as they do their sox and underwear at home (leave them where they take them off) and teachers wouldn't do that.

4. Tuesday morning I went to a meeting in Johnston regarding the Abacus instructional management program. It was a great meeting, mostly because there were only about eight people there and we had time to get into details about the program. We have looked at several throughout the year and, in my opinion, Abacus is still the most mature. Others are working on getting there but Abacus seems to stay ahead. It essentially, does it all. The matching of assessment items to objectives and outcomes is nicely done. It provides for all the reports and print outs you can dream up. Not only does the whole curriculum get into the machine, but lesson plans, instructional resources, and everything else is there to be called up from the teacher's convenient terminal. It provides for all the different kinds of assessments including pictures, moving video portfolios, handwriting samples, writing samples, etc. Everyone that I have talked to that has used such a system feels that the teachers, finally, get to have a handle on what the curriculum really is and what the real progress of their students is.

   There have been some improvements. The software, as of June sometime, will work with Microsoft Windows making P.C.'s or clones appear much more Macintosh like. The text program they use for setting up lesson plans, writing assessments, writing outcomes, etc. is Microsoft Word. In the Windows format it is virtually indistinguishable from Microsoft Word for the Macintosh. In addition, they are working on make the software to be able to allow Macintosh's be terminals on the network. That was enough to convince me so the next step was to ask about prices.

   The basic site license for up to 100 terminals (including 3 days training for trainers) is $6877.00

   Some other peripherals, of course are required. A large file server (which must be an IBM or clone and completely dedicated to the network) would be about $3500.00 The local area network (LAN) would cost about $2000.00. A document scanner is about $3000.00. An image scanner (for pictures) would be about $1000. A laser printer would be about $1500.00. Terminals for teachers' desks would be from $900.00 to $1500.00 each depending on how fancily they were configured.

   The Abacus software system also allows for interfacing with most anyone's student demographic and accounting system (attendance, addresses, etc.). The fancy one is called SASI and allows attendance to be taken by clicking on pictures of the students on the screen. Abacus will work without a satellite accounting system, however. The real "biggie" that works with Abacus is called MCAD. It is a complete curriculum in science, math, social studies, reading, and language arts. Everything is there. All the outcomes, tens of thousands of assessment items, objectives, and everything. It is designed for schools who do not do any of their own curriculum work, but it is so well done that many schools use it as a primary resource in curriculum development. The cost is fun...$7420 for all the curriculum areas. Could curriculum design become "pick and click?"

(over)
So here is a summary of software and hardware cost:

**SOFTWARE**
- Abacus (the management system) ................................................. $6877.00
- L.A.N. (Local area network) ...................................................... $2000.00
- Microsoft Word ........................................................................ $200.00
- MCAD (curriculum) ................................................................. $7420.00

**HARDWARE**
- File server system ................................................................. $3500.00
- Laser Printer ............................................................................... $1500.00
- Document scanner ................................................................. $3000.00
- Image scanner ........................................................................... $1000.00
- Terminals (each) ................................................................. $1300.00
- Wiring and hooking up network (unknown at this time)

A good start up system would be:

- Wiring and hooking up network (unknown at this time)
- Abacus (the management system) ................................................. $6877.00
- L.A.N. (Local area network) ...................................................... $2000.00
- Microsoft Word ........................................................................ $200.00
- File server system ................................................................. $3500.00
- Laser Printer ............................................................................... $1500.00
- Document scanner ................................................................. $3000.00
- 6 terminals at $1300.00 .......................................................... $7800.00

$24877.00

The other additional expense would be clerical time to type the curriculum into the system.

Remaining to be implemented in the future would be:

- Image scanner ........................................................................... $1000.00
- MCAD (curriculum) ................................................................. $7420.00
- 20 terminals at $1300.00 ........................................................ $36000.00

$34420.00

**Grand Total (by the year 2000) .................................................. $62297.00**

This grand total is a complete system with a terminal in every classroom (including the new ones yet to be built). Plans should still include additional terminals in every classroom for student use. Current recommendations for student use are three to five in each room for students. Now you are talking some serious bucks.

Read and dream. My feeling is that a system as comprehensive as this will do more to relieve teacher stress than other proposals which require continuing year to year costs. Imagine, if you will, no more scheduled reporting periods (report to parents any time you want), no more figuring of grades (progress is kept current by the system), and no more planning for conferences (you just punch up the portfolio on the terminal and ask the parents what they'd like printed (pick it up on the way out)). These costs are all "one shot" costs which do not reoccur. The only reoccurring expense is the materials for scanning assessments and costs for maintaining equipment.

Ashby
After yesterday's long bulletin, here are some more things to think about. Our number one priority for technology, as determined by the technology committee is a lab full of computers and a computer in every classroom. Our building goals include more collaboration time for teachers and an instructional management system in place by the year 2000. My friend with the integrated circuits for brains advised me that the year 2000 is too distant to be a realistic goal for technology. He is correct, but we were dealing with the practicalities of funding.

The Apple II gs series of systems have not been in production for some time and these are our most modern computers. Both the computer I bought for myself and Pat's computer, which belongs to the school, are no longer in production. The two Macintosh LC III's are the only computer technology we have that is in current production. II e's and II +'s are now being trashed. People can hardly give them away. So things are changing already.

Our needs appear to be changing. The demand on teachers is increasing in many ways, but especially in the areas of planning and development, assessment and evaluation, and progress reporting. Without the planning/collaboration time to do these jobs properly the only hope is some kind of technology that will greatly increase efficiency. Our present need to have computers in the classrooms so that teachers and students can get to them and the need for the lab for the class activities and the big reports that we do in 5th and 6th grade remains. What's new? We have old needs still there and new demands being added. Another fly in the ointment is the possibility of adding another section of some grade next year. If that happens, Lynn goes back into the computer lab and the computers get distributed. Then the class activities and big reports become a real logistical problem.

Now lets leap back again to the future. Here we are in the year 2000. Ideal situation...a computer in every classroom, a lab full of computers, and an instructional management system in place. Actually we must add to the dream. Current thinking is several computers in each classroom and there is a movement away from the lab scenario. We also may consider about a hundred other things that Nancy Voltmer has on her media/technology list. Plus there will be things that haven't even been invented yet. None of the computer things are actually in conflict with each other or mutually exclude on another. Even the CD ROMs can be accessed through the network. Our challenge is determining the path we take to get there.

With the commitment we have made to being "Manattenized" (actually becoming experts in assessment design, selection, and outcome matching), the need for the technology tool becomes a higher priority. Dick, Ralph, and I all realize that it is not realistic to remain dependent on main frame technology. If this design is to proliferate it has to be in tune with the way things are out there in the schools. Our thinking needs to be in the direction of getting the file server and management software in place even if we have to start with one machine.

Several efforts toward this end will be made to make this more feasible. Dr. Manatt is in communication with a representative of a company that makes document scanners. He will work to convince him that what Gilbert and Iowa State are starting could mean big things for his company in the future..."How about a machine for experimentation?" It may be possible to negotiate with the software company about a phased in adoption since we might be starting with only a file server and a few terminals. Data wires and hook-ups can be strung around the building by some poor volunteer sucker and a step ladder. We will continue to look for funding sources which might be convinced that our design is exemplary and needs support for dissemination.

Keep in mind that the what we decide that moves us in the above direction remains compatible with what exists now. The only decision is where to we start or what do we do first. The file server provides, in addition to the management system, all what we are presently doing. Word processing, data base management, instructional programs, etc. can all be stored on the file server. What gets better is there are no disks to hunt for and no waiting for a machine with a printer. These things are always on line.

Someone, yesterday, asked a good question. What if the file server goes down? Wrong question. The question is should have been, "What do we do when the file server goes down?" Welcome to the real world. I strained my marriage a little more when I bought a tape drive back up system so that I could have the peace of mind knowing all my data is in my brief case beside my desk at home when the school house burns down. You are all familiar with what happens when the copy machine goes down. We usually get service the same day. Service contracts are important. When the computer goes down where my wife works, a hundred plus
doctors and twice that many employees are at the throat of the repair people. These companies take system crashes seriously. Every big business in the country deals with these problems. What they don't deal with is old Ile's and Appleworks.

As I discuss these matters with teachers, we seem to all be at about the same point. We have a vision of what should be and we are trying to figure out how to put the pieces together under some significant limitations. The main thing is that we do have the vision and that we keep working toward it the best way we know how. With out the vision and without ever even starting to do anything it is guaranteed that nothing will happen. Our Transformation Team meetings have revealed to us many times that there are two types of schools. There are schools moving ahead and there are schools falling behind. Staying the same is by definition falling behind.

I realize that these long bulletins take a long time to read. They are to compensate for not having regular teachers meetings this month. One thing about them, you can choose where and when you read them. I edit them in the bathroom, but still prefer to use the paper provided on the roll.

Ashby
To: Dick Manatt and Ralph Woodward  
From: Dave Ashby  
Re: The "SIMing" of Gilbert Elementary

I have an initial commitment from all elementary classroom teachers. There are, of course, some questions.

The teachers are:

6th  Mike Korf, Donna Holtan, and Leanna Jacobson  
5th  Dorothy Rust, Amy Frankl, and Mary Stratton  
4th  Rose Houge and Paul Jelsma  
3rd  Ingrid Brady and Kathy Goodman  
2nd  Wendy Sanders and Elaine Brown  
1st  Denise Carlson, Melissa Hinners, and Gina Jenison  
Knd  Pauline Geist

Questions:

Mr. Korf is very interested, but does not teach math. Could he do something is science?

Mrs. Jacobson is interested, but does not teach math. Would social studies be a possibility?

Fourth grade is interested, but wonders from where the time will come.

Mrs. Brady is very interested Mrs. Goodman is willing to give it a try.

Miss Sanders is very interested and so is Mrs. Brown. Mrs. Brown's comment was, "I know this is what we need to do and the direction we should be going, but perhaps I will be retired before it all happens."
The attitude of the 1st grade and kindergarten teachers is that they will stick their toes in the water and see what happens. They do not understand how computer scored assessments work when students can't read and when most assessments are done differently from paper and pencil tests.

It appears that I will be able to have an IBM or clone machine available by next fall.

There are two scheduled early dismissals (2:30 p.m.) coming up. We could use both of those to get started on the project. We could go as late as 4:30 with proper advance warning. I can cancel a couple of teachers' meetings to sort of give them "comp" time.

I would not be surprised that a couple of teachers might drop out later, but I do not think it will be for long after they "see the light," and are saved by our SIMs.

Here we go boys. I expect you to protect us from the monsters and dragons that await us down there in the catacombs. Seriously, I feel great that we can get this kind of commitment with so little support (such as release time and extra money). Your support is the reason we can do this.

Ashby
TO: Mr. David Ashby

Principal

Gilbert Elementary School

109 Rothmoor

Gilbert, Iowa 50105

DATE: March 26, 1993

FROM: Richard P. Manatt, Director, SIM

205 Lagomarcino Hall

Iowa State University

Ames, Iowa 50010

Telephone: Office: 515/294-5521

Home: 515/232-0202

This is to confirm your recent request for a SIM Presentation. Please double check the following arrangements and contact me at once if there is any misunderstanding.

CONSULTANT? Dick Manatt/Ralph Woodward

HOME TELEPHONE: 232-0202 or 293-6363

WHEN Six Meetings (See Below)

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<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Year</th>
<th>Hours</th>
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<tr>
<td>1. Wed.</td>
<td>31 March</td>
<td>3:30-4:30</td>
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<tr>
<td>2. Thurs.</td>
<td>8 April</td>
<td>3:30-4:30</td>
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<td>3. Thurs.</td>
<td>6 May</td>
<td>3:30-4:30</td>
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<td>4. Wed.</td>
<td>12 May</td>
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<td>5. Wed.</td>
<td>19 May</td>
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<td>6. Wed.</td>
<td>26 May</td>
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LOCATION? Media Center Elementary Building Gilbert

City

State

TOPIC Gilbert/SIM Assessment Project

CONCERNS?

Display?

Yes No

1. Wed., 31 March 3:30-4:30

2. Thurs., 8 April 3:30-4:30

3. Thurs., 6 May 3:30-4:30

4. Wed., 12 May 2:30-4:30

5. Wed., 19 May 3:30-4:30

6. Wed., 26 May 3:30-4:30

FOR WHOM?

All Elementary Faculty Approximately 20

COSTS

N/A

PAYMENT?

FOR REQUESTING ORGANIZATION:

Name

Title

FOR SIM:

Consultant's Signature

Date
**WORKSHOP PLANNER**

School Improvement Model

**Group or School**
Gilbert Elementary School

**Date(s)**
31 March, 8 April, 6 May, 12 May, 19 May, 26 May

**Attending**
Faculty and Administrators

**Location**
Media Center - Elementary Building

<table>
<thead>
<tr>
<th>TIME</th>
<th>TOPIC</th>
<th>PRESENTER</th>
<th>MODE</th>
<th>VISUALS</th>
<th>HANDOUTS</th>
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<tr>
<td>Wednesday</td>
<td>Keynote: Curriculum Improvement and Assessment</td>
<td>Manatt/Woodward</td>
<td>LGI</td>
<td>O/H</td>
<td>RPM #59</td>
<td>Changing Paradigm</td>
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<td>Thursday</td>
<td>A Comparison: SIM Steps &amp; Your Curriculum</td>
<td>Manatt/Woodward</td>
<td>LGI</td>
<td>O/H</td>
<td>RPM # 10, 12, 15, 18, Curriculum Page</td>
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<td>The Gilbert Assessment Project Why Do It?</td>
<td>Manatt/Woodward</td>
<td>LGI</td>
<td>O/H</td>
<td>RPM #67, The Matching Grid</td>
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<td>Writing and Critiquing Test Items</td>
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<td>LGI</td>
<td>O/H</td>
<td>RPM #19, 21, 24, 26, 69</td>
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<td>Use of Measurement For Classroom &amp; School Improvement</td>
<td>Manatt/Woodward</td>
<td>LGI</td>
<td>O/H</td>
<td>RPM # 5, 30, 53</td>
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<td>LGI</td>
<td>Video O/H</td>
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Gilbert Elementary School's Goal
Complete Instructional Management System
(a networked terminal on every teacher's desk by the year 2000)

Cooperative Project Goals

*Establish base line for Ralph
Assess teachers existing knowledge of assessment item selection
Train teachers in selection and matching of assessment items
Evaluate assessment items already in place and revise
*Implement hardware and software required
  *IBM system by the end of this year
  *Interface with Manatt's scanner
*Input items and data
Develop assessment instruments and match items
Test 'em
Train teachers in analysis of results
Evaluate and revise
*Data for Ralph's study

* = Teachers not directly involved

Gilbert/ISU Cooperative Project
Selecting appropriate assessment items
Matching to goals and outcomes (...oops! "Expectations")
Testing: Formats, design, use
Report scores
Evaluate
Revise and recycle

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<td>Test Items/Skills</td>
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<td>Wed. May 12</td>
<td>Writing Items</td>
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<td>Wed. May 19</td>
<td>Using Data</td>
<td>3:30-4:30</td>
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<tr>
<td>Wed. May 26</td>
<td>Authentic &amp; Finale</td>
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Big black arrow represents everything else involved in implementing an instructional management system.
April 21, 1993

TO: Dr. Manatt
FROM: Ralph Woodward

RE: Fifth and Sixth Grade Teachers Meeting

I met with the Gilbert fifth and sixth grade teachers who will be administering the math test from Monroe County to give them some indication how their students do on a criterion-referenced test (even though it is not aligned to the Gilbert curriculum). I have attached the letter requesting permission from the parents to have their son/daughter participate. Dave reviewed/revised the letter to Dough Williams. The teachers will be testing the week of 10 May so that it matches with the time of the Saydel sixth grade students who took it last year so that I can compare them if that is the direction I take with this study.

The teachers administering the test are:

- **Sixth Grade**
  
  Donna Holtan, three sections of 21 students each for a total of 63 students.

- **Fifth Grade**
  
  Amy Frankl, 19 students
  Mary Stratton, 20 students
  Dorothy Rust, 20 students
  59 students
Dear Mr. Williams:

Please find attached your information copy of the letter being sent to the parents of fifth and sixth grade students at Gilbert Elementary School. If you have any questions regarding the project please feel free to call me at home (292-6363), or at my office (249-5450).

I would like to thank you for the opportunity to attend the school board meeting last night. It was obvious by the presentations made to the School Board that the district is student focused and strives to provide many learning opportunities for its students. You must be, I am sure, quite pleased with the progress being made by both the high and elementary school staffs towards improving their respective curriculums to meet the needs of the next generation. I feel very privileged to be a part of that effort.

Sincerely,

Ralph Woodward
April 22, 1993

Dear Parents:

The School Improvement Model (SIM) at Iowa State University and Gilbert Elementary School are in a cooperative project related to aligning test items with curriculum. A component of this research study is a comparison of the end of course testing versus periodic progress testing in the area of math. As a Ph. D. candidate, I will be analyzing the data of this study. I am requesting permission to have your child take a math survey test in order to establish base line data. The survey will take approximately forty-five minutes to complete. The results will not be used in any way for grading or evaluating your child's school progress.

Please sign the space on this release and have your child return it to his or her classroom teacher. Feel free to call me at home (292-6363), Dave Ashby, Elementary School Principal (232-3744), or Dick Manatt, SIM Projects Director (294-5521), if you have any questions about this study.

Thank you, in advance, for your cooperation and permission.

Ralph Woodward

Yes, you have my permission to include my child, ______________________, in this project.

Parent signature: ______________________ Date: _____________
April 26, 1993

To: Cathy Braun
Dorothy Rust
Mary Stratton

From: Ralph Woodward

Concerning: Instructions for Administering the 5th Grade Math Test

1. Since this is a research project, each child taking the test must have parent permission to do so.

2. In addition to the test booklets, you will find enough "bubble sheets" for your class plus several extras. If you need additional sheets, there are extras in the main office.

3. One sheet has been filed in as a sample. The students need to understand that the entire bubble must be well darkened with a number 2 pencil when choosing their answer. You may want to demonstrate by using the transparency provided.

4. Since this test has not been aligned to the curriculum, let the students know that as they take the test, there will be some questions that may not have been covered in class but to try them all and do the best that they can.

5. This is not a timed test so you may want to administer it over two periods, it is up to you.

6. All test booklets, student answer sheets and signed parent permission slips need to be returned to the main office by the close of business on May 14.

If you have any questions, please feel free to call me any time at home (292-6363) or at my office (294-5450).

Thank you for all of your time and effort on this project. They are much appreciated!
April 26, 1993

To: Donna Holtan

From: Ralph Woodward

Concerning: Instructions for Administering the 6th Grade Math Test

1. Since this is a research project, each child taking the test must have parent permission to do so.

2. In addition to the test booklets, you will find enough "bubble sheets" for your class plus several extras. If you need additional sheets, there are extras in the main office.

3. One sheet has been filed in as a sample. The students need to understand that the entire bubble must be well darkened with a number 2 pencil when choosing their answer. You may want to demonstrate by using the transparency provided.

4. In order to get an accurate printout of the student test results for sixth grade math, you will need to assign a student number for each section of sixth grade math that you teach. May I suggest that the first section start with 100, the next 200, and the third 300 (e.g. the first student in section one would be 101, the next 102, etc.; the first student in section two would be 201, the next 202, etc.; section three would start with 301, then 302, etc.)

5. Since this test has not been aligned to the curriculum, let the students know that as they take the test, there will be some questions that may not have been covered in class but to try them all and do the best that they can.

6. This is not a timed test so you may want to administer it over two periods, it is up to you.

7. All test booklets, student answer sheets and signed parent permission slips need to be returned to the main office by the close of business on May 14.

If you have any questions, please feel free to call me any time at home (292-6363) or at my office (294-5450).

Thank you for all of your time and effort on this project. They are much appreciated!
Members Present:  Dave Ashby, Principal, Gilbert Elementary School  
Dr. Dick Manatt, SIM Director  
Ralph Woodward, Graduate Student and Researcher  

- There are two in service days available to work with teachers at length (2:30 - 4:30):  
  April 21 and May 12.  
- The goals for the teachers are to provide a foundation to have them be proficient in test  
  expertise and remove the burden of/from standardized tests since they are not aligned  
  with the curriculum (the written, the taught, and the tested). The concept of "see one, do  
  one, teach one" will reinforce the steps of the learning process.  
- This will be a six to seven hour foundation experience for the staff and other interested  
  district personnel. In order to provide a pattern/system to the series that can be  
  transferable to other subject areas, mathematics will be the central focus.  
- The dates for the sessions are:  
  March 31 (Wed.), 3:30 - 4:30  
  April 8 (Thurs.), 3:30 - 4:30  
  May 6 (Thurs.), 3:30 - 4:30  
  12 (Wed.), 2:30 - 4:30  
  19 (Wed.), 3:30 - 4:30  
  26 (Wed.), 3:30 - 4:30  

- Ralph will work with the fifth/sixth grade mathematics teachers for an additional two  
  days. The students of those classroom teachers will be asked to take the mathematics  
  test developed by Monroe County. The intent is to give the teachers the practical steps  
  in test interpretation and provide feedback on the matching between the test items and  
  the curriculum being taught at Gilbert. I will use the results to compare those from
Saydel Community School District for research purposes.

- One problem that SIM has had in working with various school districts is thought to be that each has allowed teachers to develop different cultures which makes each experience unique/difficult for consistency.

- It is important to remember in outcomes based education (OBE) that:
  - learner outcomes are based on subject matter
  - are centered on concepts and skills.
(Due to the structure detailed below, there will not be many regular Wednesday teachers' meetings for the balance of the year. It will be necessary to do most communication via these bulletins. Please get any announcements etc. that you might make at teachers' meetings to me and I will put them in one of these daily bulletins.)

1. Joe Loonan has asked that teachers get their spring field trips scheduled ASAP. His calendar is really piling up now. He needs some advance time to arrange for drivers etc.

2. Nancy Peterson, high school social studies teacher, asked me if any of the elementary teachers would like Thomas Jefferson and Sally Jesse Raphael to come visit. David Edwards, former Gilbert student, and his sister Sarah will performing in costume on April 13th. David is playing Thomas Jefferson for a college project. He will be interviewed by his sister playing Sally They are doing it at the high school at 12:50. They would come over ahead of that time to perform for a couple of classes. Call or send a note to Nancy Peterson if you are interested.

3. Quote of the day: "God put me on this earth to accomplish a certain number of things. Right now I am so far behind I will never die."

4. My meeting with Dr. Manatt and Ralph Woodward went, in my opinion, very well. We have a workable structure set up. It was challenging to create something with little time and no money. We are going to start right away with training sessions this spring. Some time in April or May, Ralph will administer a test to selected classes to establish baseline data and give Gilbert teachers a beginning experience with their assessment procedure. The teacher commitment at this time is, basically, training with a small amount of work involving almost no time outside of the training sessions. Even though the training will focus on math, it will be designed generically so that the skills will transfer to other subject matter areas.

Attached is a sheet showing the ISU/Gilbert Elementary project fitting into our year 2000 goal of a complete instructional management system. The goals and the meeting times and topics are also listed. I have negotiated with Mr. Williams to get flexibility for teachers to get compensation time for the meetings which last until 4:30. Basically it is as I said in a previous bulletin. If you have a meeting coming up that lasts until 4:30 and want to leave with the students on a different day or come late in the morning to make up for it, you may. In addition, the 2:30 early dismissal on April 21 will remain unplanned for the elementary. Teachers will be allowed to use that time to work on whatever they feel is important. There will be no speakers or meetings.

One of the main objectives of the training will be to make teachers experts on criterion reference testing. This is necessary as we move toward weaning you away from the ITBS's that you hold so dear. Another objective is the assessment selection and matching. This is an integral part of our future instructional management system. Dr. Manatt said that he would charge as much as $160,000 for what we will get for free.

As Dr. Manatt discussed the material for the training sessions the thought college of credit passed through my mind. He read my mind, because before I could ask, he volunteered that he would try to arrange for 3 hours of 600 level credit for those teachers who are interested. Sounds like some quick credit for not that much work. He did not volunteer to pick up the tuition.

The dates and times are listed on another page. Below is a more detailed description of each meeting. Dr. Manatt said that if there was a certain meeting that a teacher could not attend, the meetings are packaged enough that there would still be great benefit from attending the rest. There will be materials at each meeting and extra copies for those who have unresolvable conflicts.

Meeting 1.
This is the "here we go," "Go, Fight, Win," keynote presentation discussing the changing paradigms of instruction and assessment. Dr. Manatt will also deal with the controversy surrounding OBE, America 2000, and the State outcomes, etc.
Meeting 2.  
This will be a comparison of the SIM steps to the Gilbert Curriculum development model including philosophy, goals, scope and sequence, etc. As he skimmed through the materials we noticed considerable match and no unresolvable differences. Please bring copies of the math curriculum to this meeting.

Meeting 3.  
Here we will be getting down to the nitty gritty of selecting assessment items and the "how to" of matching to outcomes (...oops! "Expectations"). What is a good test item? What is a good foil? What do we already have in place that is fine? What could we improve? The SIM test item bank. Dr. Manatt was pleased to hear that some of our teachers had already worked with Dale Foreman on these things.

Meeting 4.  
At this meeting teachers get actual practice in writing and selecting assessment items. This is the two hour meeting.

Meeting 5.  
Skills will be taught on disaggregating data, ethical and unethical use of measurement, legislation, where is Gilbert and Iowa on these matters, how do we use the data, interpreting results, etc.

Meeting 6.  
Authentic assessment, criterion reference tests, relating to Bloome's taxonomy, and blessing of Gilbert elementary teachers for their magnificent work.

Dr. Manatt said that he, as a result of this project, would expect to see a cadre of Gilbert teachers trained as experts qualified to go and train other teachers. It sounds to me like some of our teachers may find themselves, in the future, in front of other teachers in other schools "spreading the gospel." You can also bet that he is already discussing the great work at Gilbert Elementary as he travels around the country. He will mention us right along with his work in Arizona South Florida, Wyoming, and other states. We will be the first school where hundreds of thousands of dollars have not been paid and we will be the first school to demonstrate the practical application at an average sized school. Ralph really feels that most schools know about paying big money for big guns to come in and do big things. Ralph feels that Manatt wants to demonstrate that, without big money, big things can be done in small schools and he wants to start something that has nation wide ramifications. What a retirement present for me to see Mary Stratton speaking to some school in Michigan about how we did it in Gilbert or Mike Korf presenting at the national convention of elementary school principals. Don't get fat headed yet, we have work to do.

I could not negotiate each meeting time with the faculty. I had to take a chance and create the best schedule I could. If we have some teachers who now find it unworkable, Dr. Manatt and I both understand. Just let me know. We do need a solid corps to make it fly. Repeating what I said above, if you decide not to fully participate, you are still invited to attend whatever meetings you can.

I am attempting to get some sub-pay for release time for teachers to work. I have not accomplished that yet, but there are possibilities.

At the beginning of our meeting Dr. Manatt made a comment that I thought was appropriate for a conclusion here. He said that Gilbert teachers will notice a marked increase in the precision with which they are able to evaluate student performance and design appropriate instruction. He was concerned that this might be quite a change for some. My thought was that if I were teaching, I would be delighted to remove some of the sweat and subjectivity from student evaluation.

Ashby
To: Dr. Manatt  
From: Gilbert Elementary sixth grade teachers  
RE: Florida test in math  

We have reviewed the test and find the following (by item number)  

Items 10, 14, 17, 32, 33, 45 have not been covered yet.  

Items 20 & 21 - We do not test for mastery with 3 digit divisors  
(curriculum committee decision)  

Item 27 (dg. and eg.) The prefixes are covered but only with distance in metric not weight.  

Item 28 We have done simple algebra with plus and minus signs, but not with multiplication and division.  

Shall we explain to the students that, as they take the test, there will be some questions that have not been covered in class?  

If questions, call Mr. Ashby at 232-3744 or FAX to 232-0099
To: Dick Manatt

From: Dave Ashby

When summing up next Wednesday, you might take a bit of a look into the future, maybe relating to the things we are getting started with NCS.

I am finding that, even though their enthusiasm is high, the teachers have varying visions of where we might be heading. For example some teachers think that some one else will select items for a test item bank and they only select for the actual test. Others think that teachers will determine the test item bank and an operator will pick the test questions. Neither view is exactly correct. You might give them some opportunity to ask questions about the future. Some of the answers may have to be deferred because even you, I, and Ralph may not have a handle on what our finished product will be. Maybe it is so evolving that it can't be defined. Evolution is in the nature of what we are attempting, but it is not settling for teachers as they try to see the vision.

Bill McNatt will send me details about Performance Plus. I am anxious to critique it. You heard my question when I wondered how they do all that linking in a flat data base. I have many others. I will communicate with him, you can be assured.

Something else you need to know about. The Carl Perkins consortium, with which we are associated is also looking into instructional management systems. They are discussing providing a management system to member schools via some kind of deal they hope to cut with LTS (the 4th Dimension based system for Macintosh). I know 4th Dimension fairly well and am familiar with its strengths and its shortcomings (such as speed (even when compiled)).

We need to keep track of these external developments. We don't want to be the nerd at the party when every one else around us is a slickly dressed frat rat unless we are the nerds with the better system and they have to come to us because we have a brainier way of doing things.

You may have seen me grinning when Bill was telling us about how Macintosh built their computers backwards. I was thinking "Right, Bill, can the P.C. address megabytes of RAM directly like the Mac? Do the P.C.'s keyboards put out standard ASCII characters like the Mac? Why did they hasten to invent Windows (and face some big lawsuits)? There were several other zingers, but I kept quiet. I didn't want to "you know what" in our own mess kit.
Another thing that I wanted to share with you. At our last School Improvement Team (formerly Transformation Team) meeting, we discussed outcomes, the Governor, etc. Even though what we have developed contains many of the "look, feel, and value" outcomes we decided not to throw them out. Since things like working hard, being honest, getting along with people, etc. are among the attributes people who hire people like to see, we thought we should keep these outcomes. What we changed is our approach. Rather than attempt to evaluate (and get assassinated) whether a child is honest, we have decided that our goal is to "create an instructional atmosphere where these values are likely to be developed in students." We simply shifted the burden for performance from the student to the school system. We will also emphasize that the regular "academic" outcomes and expectations have always been there and we are continually improving these, not abandoning them.

Have a good weekend!
August 2, 1993

Luba B. Lewytzkyj, Senior Market Manager
NCS Education
11000 Prairie Lakes Drive
Eden Prairie, MN 55344

Dear Luba:

This is to confirm our many discussion points of July 27 and 28.

1. The partnership between the Gilbert School District, NCS and the School Improvement Model (SIM) Office at the Iowa State University College of Education is a reality. This operation, with the data processing activities centered at the Gilbert Elementary School, will be our R & D Center for all we do. Gilbert will be asked to host demonstration meetings.

2. We have agreed to share information, skills and our considerable experience to help you maximize the improvement and sales of Performance Plus and auxiliary programs.

3. Key personnel will attend meetings--regional and national, and at your corporate headquarters, to plan and promote the program.

4. SIM will share its products which have potential for enhancing your products and sales.

5. I will help you obtain "curriculum" for Performance Plus. Remember, the curriculum and test items are the intellectual property of our client districts--not the property of SIM. Nonetheless, our client districts have always hoped to sell what we have developed to recover some start-up costs.
6. Our folks will be happy to train your sales force in curriculum renewal, alignment and all types of assessment. Perhaps we should think about making a 1/2" VHS video to "take our story to the field." Our University Media Resources Center can do that for us at a very reasonable cost.

We agreed that all of this will start with a meeting at your office during the week of August 23--would it be possible to meet on August 27? Meeting on this date would enable me to bring the key players from Ames.

Thanks again for taking the time to "visit the flood plain." I'm sure this relationship will be mutually beneficial!

Sincerely,

Richard P. Manatt

RPM/cw
Enclosures: School Improvement Model Clients
SIM--Contracts and Grants in a College of Education
Outcomes-based education: A battle over Iowa schools
Article from International Journal of Educational Reform
Five Factor Teacher Performance Evaluation for Career Ladder Placement
The Changing Paradigm of Outcomes and Assessment
The Attack by the U.S. Religions Right on "Government Schools" . . .

c: David Ashby, Gilbert Elementary Principal
Douglas Williams, Gilbert Superintendent
Char Hulsebus, Gilbert School Board President
Ralph Woodward, Iowa State University PhD Candidate
Katy Rice, SIM Consultant and Gilbert Board Member
PLEASE NOTE

Per letter from school
pages 233-234 are of poor quality
and a better copy is not available.

University Microfilms International
THE PARTNERSHIP

Iowa State University, Gilbert Elementary School, and The NCS Corporation

For many years there has been cooperation between Iowa State University, especially the College of Education, and Gilbert Elementary School. Gilbert Elementary School, as with many other area schools, has had graduate students, pre-service student teaching observers, Iowa State graduate students doing research, and other university activities in the school buildings. In turn, Iowa State has been a resource for school projects, teacher training, field trips, college professors making public school classroom presentations, and even for help in designing playground equipment. This cooperative attitude and working relationship has been beneficial to both organizations.

In the spring of 1999 what started out as a typical graduate student research project blossomed into a full fledged official Iowa partnership among Iowa State, Gilbert Elementary School, and the NCS Corporation. Dr. Richard Manatt, Iowa State professor and veteran of 30 plus years of experience in the areas of school improvement and teacher evaluation added the vast sound and experience of the SIM (School Improvement Model) into the mix. Because the project involved student progress assessment, the NCS Corporation provided all the student testing, test scoring forms, and instructional management systems, to use as an added partner to add. Dr. Manatt's previous working relationship with NCS opened the door.

Gilbert Elementary School had set a building goal (for the year 2000) to have an instructional management system in place. The particular challenge was for a small school (less than 1000 students) to accomplish this. But a good management system is more comprehensive than just test results, it also includes reporting. A good system ties the instructional objectives to the teaching and relates teaching via technology. The partnership will move that management goal forward.

Iowa State University SIM needed a place to test its observers to see results in action. Gilbert is only six miles from the campus and is very handy for avoiding costly air travel to other schools around the state. The district policy allows for multiple research projects to be attached to the actual observation trip. The research will document the effectiveness of the efforts.

NCS Corporation (National Computer Systems) had a school site for beta testing and for demonstration. They now utilized the Gilbert site. Knowing full well that education represented more than half of their business and also knowing the financial constraints of many educational institutions, they perceived the need to have an advantage over their competitors. They had provided the Gilbert Elementary School with their latest versions of management software, planning, and testing.
This is an evolving partnership and goal and design and revised along the way. The partnership is unique in that there are very few if any, the relationships among a major corporation, a major university, and a public school. Most of the speakers who have recently focused on school improvement have emphasized the importance of teaching for and preparing students for a world that has changed considerably. This partnership and the precision management, the well conducted research and the carefully paced exploration of new student measurement tools and bases and ground should be a valuable vehicle for meeting students needs in a changing world.

Dr. Richard P. Manatt, Professor of Education, ISU and ISP project
Ralph Woodward, ISU graduate research assistant
David Ashby Principal, Gilbert Elementary School
September 16, 1993
To: Dr. Manatt
From: Ralph Woodward
Re: Meeting with the Gilbert Teachers (9/16/93, 2:15 - 4:00)

• Dave gave a report of our trip to Minneapolis and the meeting with the NCS people. He also shared Katy's notes and the draft of the mission statement that was developed there. He then dismissed the staff except for the fifth and sixth grade teachers.

• Dave gave an informative overview of Performance Plus. Her did not hedge as to how cumbersome data entry was.
  • Gilbert's task in the next several weeks is to load the student demographics, class lists, and begin with the fifth/sixth grade math curriculum.

• It was at this point that we began discussing test items and test item banks. The teachers were under the impression that since they were to have access to SIM's test item bank, all they would need to do was type in an objective and the test items "would just pop up". I stated that the software was not compatible so the test items would still need to be selected according to their curriculum objectives then entered into Performance Plus for access (I hope the statement on compatibility was correct). They were also confused as to their need to write test items since banks were available to them. I commented that since not all of SIM's student outcomes had test items already written, there would be a need to write test items for those skills. The teachers concern seemed to be with the time required for writing test items. Dave stated he could arrange for time during the day for that purpose. Towards the end of the conversation, they appeared to understand the need to write items for their formative tests and seemed willing to do so if given release time.

• Dave reiterated his previously stated goals and added that if they could write a formative test for the two grades and pilot it by the end of the semester, they would have made a lot of progress.

• Dave was going to read the manual for the Test Item Generator then pass it on to me.

cc: Dave Ashby
September 16, 1993

To: Dr. Manatt

From: Dave Ashby

Re: Report on September 15 meeting with Gilbert Elementary teachers

Copies to: Gilbert teachers, Katie Rice, Ralph Woodward, and Doug Williams

As was our meeting in Minneapolis, the early dismissal on Wednesday was productive. I reported to the teachers regarding our Minneapolis experience. I tried not to be too snooty about associating with $100k plus salary earners. One teacher had eaten at Ciatti's and gave it the same rave reviews we did. We decided she must be snooty too.

The Board of Education and the elementary teachers have received copies of Katie's rough draft report.

After the brief report on the trip to Minneapolis, we focused on Performance Plus with the 5th and 6th grade math teachers. The objective was to prepare for the data entry required to get Gilbert Elementary's system operational. We will scan in the student demographic data and do the class loading also via mark sense form. I spent some time comparing the curriculum hierarchies of Performance Plus, SIM, and Gilbert School. I made them aware of the consistency in coding concern the SIM people have. Their homework assignment was to think about and reconcile the three approaches and then make a recommendation on an hierarchy for us to use with Performance Plus. Ralph has not had concerns about this decision. The point is that once we decide what the hierarchy is we must remain consistent. We set a goal to get all the data in and have at least one 5th grade and one 6th grade math test administered, scored, and reported in a month to six weeks.

The discussion that lasted from this point through the end of the meeting had to do with test item banks and selecting test items. We (meaning the teachers and I) had different perceptions of the process. My perception was that we would start with what we have and then add and improve as test items and test item banks became more available (i.e. SIM, Monroe County, NCS revision of ASSURE, etc.). Their perception, which was the basis for much of the excitement about entering this partnership, was that they knew their existing items were mostly items purchased from vendors and they had rejoiced to hear some professor from Iowa State make sweeping promises about access to hundreds of research perfected (valid, reliable, etc.) test items. Test item creation is the most time consuming aspect of curriculum development and they were, frankly, licking their lips in anticipation.

This is the main objective of this memo to you. The teachers want to know, "Where are they and how do we get at 'em?" The teachers had developed a perception that the procedure was to type in an objective and up would pop many great test items from which to choose. Ralph and I stuttered and stammered and tried to explain that we didn't think the process was that simple. We left the meeting after promising communication with you.
and also promising that I would read the program manual for the Performance Plus Test Generator.

Giving up Star Trek, I perused the manual and offer the following brief summary:

Test items are entered into databases called "item banks." Each item bank may contain up to 2000 test items. There may be as many item banks as desired. Numerous descriptors may be added so that the individual items can be described in different ways. The items can be searched and called up to assemble customized tests. The test generator produces test printouts and tracks test items. Once generated, the tests can be loaded into Performance Plus for test scoring and student performance tracking.

There are four basic functions:

1. Creating item banks and adding items to the item banks
2. Browsing, reviewing, and editing existing items in an item bank
3. Test assembly by manual selection, searches, and random selection
4. Printing the test in final form with test keys and test feedback reports.

The list below of common terms used will help in understanding the test generator:

1. Question Type
   - True-False, Multiple Choice, Matching, Fill-in, and Essay

2. Item Bank
   - A group of questions stored on disk in the same data file. These questions are usually related in some manner. For example, they may relate to the same subject or course.

3. Test File
   - A data file containing a listing of the items that have been selected by the user to constitute a particular test.

4. Figure File
   - A text of graphics data file that contains text or an image, such as a graph or picture; that is associated with certain items. Figure files are printed with these items.

5. Question Stem
   - Usually applies to a multiple-choice or matching item. It is the first part of the item that presents the questions, situation, or problem.

6. Answer Stem or Distracters
   - Usually applies to a multiple-choice or matching item; the correct response(s) and the alternative responses that might distract the test taker (answers A, B, C, D, E).
7. Descriptors

Information that in some way describes or relates to an item. It could be the question type, correct answer, textbook page reference, answer explanation, difficulty level, date last used on a test, subject, topic, or cognitive type.

8. User Descriptor

A term created and entered by a user that in some way describes or distinguishes particular questions. Examples: addition, subtraction, division, etc.

9. User Category

The name given by the user to a group of descriptors. Examples: Topic, source, chapter, or cognitive type.

10. Form of a Test

A version of a test. The test generator can print out up to 4 different forms of a particular test (test file), by scrambling the order of the items and/or by scrambling the order of the distracters. Distracters are scramble only for multiple-choice and matching items.

It also allows for different question types on the same test and has a built in spelling checker.

Hopefully, the above memo will communicate with Dr. Manatt regarding the aspirations of Gilbert teachers. It should also provide information relation to tests and test generation. Our (Manatt, Ashby, Woodward) assignment is to pin down the process for making externally generated test items accessible to Gilbert Elementary Teachers.

C: Ralph Woodward
To: Dave Ashby
   Doug Williams

From: Dick Manatt

Date: September 22, 1993

Re: Memo of September 16, 1993

Dave, the misunderstanding probably came from my describing test items banks which are sold with no curriculum work to back them up! (i.e., no learner outcomes embedded in a robust new curriculum, no identification regarding Bloom's Taxonomy or what sequencing--entering, extending, mastery, etc.). The gift to the faculty is the thousands of man hours expended by both SIM and our clients since 1978 to support curriculum/assessment modernization and the know how to expand the test item using your curriculum and our curriculum and summative items.

Each teacher will write some test items to supplement what we already have. That's how we pay for the free lunch!

The maxim "There's no such thing as a free lunch" comes to mind. Explain to your faculty that SIM has summative pre- and post-testing ready to go. SIM also has the experience and skill to teach them how to write more test items.

Because interval, or segmented testing is needed for mastery teaching, our joint venture involves getting for Gilbert the hardware and software needed. They must go beyond the formative tests in order to support the mastery teaching you want to do.

Cheers!

RPM: cw

cc: Katy Rice
    Ralph Woodward
The mission of the partnership is to improve curriculum and assessment in K-12 schools through collaboration between College of Education researchers, Gilbert faculty and staff and National Computer Systems staff. The partners will assist teachers in their efforts to ensure mastery learning, equity, and improved quality for all students through a management information system.

*Gilbert Community School District*

*School Improvement Model, College of Education, Iowa State University*

*National Computer Systems*
Kay Christiansen, Vice-President of the Education Division, presented information on the structure of the Education Division of National Computer Systems. They have three divisions:

**Measurement Service Division:** Oversees test scoring analysis and reporting, national test publishers, state assessment programs and National Assessment of Educational Progress. It also monitors the movement away from NRTs to state assessments. This division teams up with the Curriculum and Assessment Division to score and design tests for states. It is working with NAEP to design technology, i.e., electronic transfer of essay questions and geometric solutions from evaluator to evaluator.

**Information Technology Division:** Oversees the transfer of data such as student transcripts from school districts to colleges, universities and community colleges cross country and intrastate. This division is also involved in providing more meaningful information to post secondary schools, i.e., student achievement tracking through a child's K-12 experience.

**Curriculum and Assessment Division:** Oversees assessment, instruction, student data, human resources, and finance. These areas include:

<table>
<thead>
<tr>
<th>Area</th>
<th>Responsibilities</th>
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<tbody>
<tr>
<td>Assessment</td>
<td>State assessments, item banks, scoring software</td>
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<tr>
<td>Instruction</td>
<td>Instructional management (Performance Plus, Assure)</td>
</tr>
<tr>
<td>Student Data</td>
<td>Academic reporting, attendance, scheduling</td>
</tr>
<tr>
<td>Human Resources</td>
<td>Employee management, payroll processing</td>
</tr>
<tr>
<td>Finance</td>
<td>Budgeting, accounting, accounts</td>
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Dick Manatt presented the rationale and methodology behind the School Improvement Model criterion-referenced testing projects.

Joan Hansen explained new products and the future.
Luba Lewytzkyj facilitated a discussion on expectations from each partner:

**Expectations of partnership:**

**NCS:**

- Expects Gilbert/College of Education (COE) to serve as resources to NCS regarding product
- Expects Gilbert/COE to reference NCS at school sites
- Expects Gilbert to serve as a demonstration site
- Expects Gilbert/COE to showcase partnership at conferences when available

- Will measure success of the product
- Will provide software training and support
- Will provide "turn key system"
- Will communicate with public/partners/staff
- Will reference--COE/SIM/Gilbert
- Will provide Open House support
- Will productize curricula
- Will provide resources in the areas of curriculum and assessment, marketing and training
- Will publicize the partnership via organization newsletters and other publications as appropriate
- Will provide future software to Gilbert at reduced and/or negotiated rates

**Gilbert**

- Expects a management vehicle

- Will establish curriculum goals and objectives.
- Will provide feedback to NCS on product
- Will purchase a scanner
- Will serve as a beta site
- Will provide prototypic evaluation
- Will provide evaluation specifications
- Will reference--COE/SIM/Gilbert
- Will publicize the partnership via organization newsletters and other publications as appropriate
- Will pilot test NCS item bank
- Will pilot test Assure item bank
- Will assist NCS in sales training
• Will provide future staff--i.e., support staff to input items, teacher time
• Will provide staff development for teachers--i.e., writing test items
• Will share competitive information with NCS
• Will look at MCIMs (student/administrative management system--
scheduling, attendance, grade book, reporting)

College of Education, SIM
• Expects to reduce unit costs of curriculum renewal and assessment
development

• Will provide the research and development thrust to determine "is it
working"
• Will write monographs indicating the difference it makes
• Will reference--COE/SIM/Gilbert
• Will reference NCS and Curriculum and Assessment
• Will publish information about this alliance in journals, etc.
• Will assist in pilot testing test items
• Will assist in standardizing curriculum
• Will provide analysis of competitive products
• Will provide curriculum ID--acquisition assistance and reference

FORMALIZATION OF PARTNERSHIP

Gilbert will work out a written mission statement and FAX it to Luba. NCS
will refine this and return it to Dick Manatt. This information will be
presented to the Gilbert School Board at the October 11 meeting. The mission
statement will become part of the October 5 Open House.

The COE/NCS partnership will be tabled until history and models have been
reviewed.

OPEN HOUSE: The following is a summary of responsibilities
for the October 5 Open House:

BOOTH--Exhibit Board (Luba)
GIVEAWAYS (Luba)
ObScan 5 (Bob Duff)
Develop practice test (Dave/Ralph)
Reports/Literature (Luba/Joan) 200 pieces
Press Release (Cheryl Kyweriga 612-829-3113, Katy, Dick)
Mission Statement (Gilbert Team)
Next meeting date: November 16 at 9:30am, NCS--Owatonna.
The purpose of this meeting will be to establish:

What will each contribute
Timeline for these contributions

What will be done by the next meeting?

1. Gilbert will match test items to their curriculum and enter curriculum and test items.

2. A progress report will be given to the Gilbert Board of Education and approval will be obtained.

3. NCS will draft a Letter of understanding for the partnership by October 1 and provide copies of that letter to Gilbert and SIM.

4. A mission statement will be created and approved by all parties prior to the October 5 Open House. This mission statement will be displayed at the Open House.

5. SIM will conduct sessions with Gilbert teachers to provide an update and expectations.

6. NCS will contact Bob Duff to ask him to present at the October 5th Open House and the October 6th session with the Gilbert teachers. He will need to be available for setting up the exhibit early afternoon of October 5 for a 5:30-7:00pm demonstration. The session with the teachers on October 6th will start at 3:15pm and go for approximately two hours.

Submitted by,

Katy Rice
NCS Education

Partners for Educational Excellence
For more than 30 years, NCS Education has contributed to the academic success of millions of students, from their first day in kindergarten to beyond college graduation. NCS touches:

- One of every two children in our nation's schools
- 850 of America's largest 1,000 school districts
- 12.5 million students receiving federal financial aid

NCS provides the technology, experience, and quality customer service that are essential to improving our nation's educational system.

At the local school level, NCS provides software and scanning applications and services that manage assessment, instructional, financial, student, and human resource information. Assessment and instructional products and services provide educators with critical tools to increase productivity, measure student progress, and manage increased accountability requirements. Administrative products and services enable school administrators to reduce costs and increase operating efficiencies by creating a networked information management system among classrooms, schools, and district offices.

At the state level, NCS provides educational testing and measurement services, processing more than 26 million students tests in 1992. NCS is the largest provider of test scoring, test analysis, and reporting services in the nation. In addition, NCS serves the nation's leading test publishers, implements more than 15 state-wide student assessment programs for state departments of education, and scores the National Assessment of Educational Progress (NAEP). As we move to the future, NCS software applications and services will continue to permit educators from the local school level to the state to communicate and share critical administrative and instructional information.

At the national level, NCS supplies large-scale database management, information networking, and systems integration for delivering more than $17.5 billion in Title IV financial aid to 7,500 post-secondary institutions for the U.S. Department of Education. In 1992, NCS processed financial aid records for 12.5 million students.

Our goal is to help ensure that every student has a greater opportunity to succeed.
A wise old man once said when presenting a speech, "Tell them what you are going to tell them, tell them, then tell them what you told them."

I. I am going to tell you:

1. There was a revolution in learning psychology 20 years ago. We discovered how the brain works in cognitive learning.

2. Cognitive learning is nothing more than learning concepts. Skills is another type of learning but all learning starts out with concepts.

3. Computers got small, cheap, and showed up at the work site.

4. To keep track of student's learning is too complex for the grade book method used by teachers - - let alone 30 to 150 students.

5. Assessment drives instruction. Students only study what the teacher mentions in class - - forget the books on reserve in the library, if it is not mentioned in class the students will not read it.

6. The right kind of assessment is called curriculum aligned testing. The typical Arizona District will have curriculum aligned testing by the year 2003.

7. The Gilbert School District will have it now - - not 10 years from now - - and our partnership will bring it about.

II. Tell them:

A metaphor is a figure of speech when one term is used to describe a different object or condition such as "evening of life" for an old duff like me. Or a "ringing bell" to stand for the pain of a headache.
1. Old metaphor for learning: "school as a factory - the business of learning was adaptive, learning controlled by decline and events outside the learner." The learning was seen as the recipient moving through an assembly line of classrooms while the teacher's role was to give information in "chunks";

* Since 1970, new metaphors have come about: "The focus of learning is the learner - successful learning is internal to the individual." And "The mind is an information processing system."

This new understanding tells us much about how we should create curriculum, teaching, and assess student performance. What does this tell us?

* **Shift** away from rote memorization of isolated parts.
* Now, instruction should enable students to **construct meaning** by linking new information to prior knowledge.
* Connect school learning to real world tasks and issues.
* Students must get actively involved with content, question premises, apply information to new examples and situations.
* Students learn how to learn by developing a set of cognitive stringers (the curriculum plan helps).
* Student's learning needs depth not breadth. Read the original book, not Cliffs Notes; read the constitution not a comic book about the founding fathers; do not do 22 repetitions of a math exercise if they get it the second time.
* Right now there is generally a poor match between what is taught and what is tested in the way standardized testing is conducted.
* Standardized tests are insensitive to instructional efforts and to an individual student problems.
* We need curriculum aligned testing, a very well defined **scope** that is breadth - what to include, what to leave out, - sequence and scope. To do that Sue Beers and her people spend days scanning and shifting - - at the same time the SIM Project has been doing that in seven districts; in Minnesota, Wyoming, Florida, Iowa, Arizona, and now Kansas.

* What does the academic society recommend?
* What does the state require?
* What spirals (repeats) in the curriculum?

We need interval or segmented testing so both the teacher and the learner knows what went right, with what went wrong, and what to do next. Feedback - - knowledge of results not just dry theories.
Knowledge of results imparts volition: trying harder, very careful, paying attention, meeting deadlines, self-restraint, and endurance. This curriculum has to be designed with the right sequence of concept and skills and it has to have what is the appropriate age, grade, and time to introduce teaching sequence of concepts -- skills that must be earmarked for "planned" abandonment because we can not retain everything in K-6 or K-12. When Gilbert and our previous client districts got done writing curriculum, it was too complex to put in the grade book.

2 This is where, the computer and our partners software, Performance Plus, comes in. You can be sloppy with a manual system -- but you can not be sloppy with a computerized system. Performance Plus -- is like a spreadsheet. A spreadsheet holds your formative data -- but you have to generate the data bits and you have to put it in right.

- Performance Plus is a package for the curriculum you have planned -- enhanced by cross checking against what we have been demonstrating wide for 17 years; 3 years at a time in district after district.
- Performance Plus holds your curriculum in learner outcome form, what must the student do -- the teachers have specified that.
- Performance Plus -- hooked to these teaching and learning instructions are test items to measure the success of the student in learning the concept.

3. The package keeps track and makes reports for each student, section, all of a teachers section, and the whole school, -- and it is immediately available to the teacher -- not just once a year from Iowa City.

4. Assessment drives instruction or standards -- driven right \( \Delta \) results \( \Rightarrow \) OBE

5. We can have it now; reasons:
   a) SIM groundwork
   b) your curriculum work
   c) a partnership from business who trusts us to be the pioneers of curriculum aligned testing.
III. Tell you what I told you:

Why: Your faculty - Ralph/SIM/NCS, matching Performance Plus to your technology of micro computers, etc.
What: Your system piloted math 5th and 6th grade.
When: School year 1993 - 94.
When: Next school year all K - 6 math?

<table>
<thead>
<tr>
<th>SIM</th>
<th>Gilbert</th>
<th>NCS</th>
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<tr>
<td>• How to</td>
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<td>• Form Models</td>
<td>• Ideas</td>
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From Dave Ashby

By this time I hope Ralph has shown you the printout of our first attempts at curriculum entry. Our original scheme was as follows:

COURSE
   GRADE
   STRAND
PROGRAM GOAL
   TLW (The Learner Will's)

This hierarchy made Gilbert and SIM compatible. Then we attempted to add TX for Taxonomy on the end, but that caused a separate line to be generated. I have calls into NCS for advice. What do you think of swapping taxonomy and TLW? This would add a step between program goal and TLW. Talk to Ralph, Shirley, and whoever and see if that messes up the compatibility. One way to think of this hierarchy is that of a sorting sequence. You can get a clue by looking at the printout Ralph has. It would be like sorting first by course, then level by level. The next levels in the order would be grade level, strand, program goal, taxonomy level, and TLW.

The way Performance Plus works it is that if you conduct a search on just the subject, i.e. math (MA) you get the whole math curriculum printed out. If you search for math and grade, you get the whole sixth grade math curriculum. If your search for math, grade, and a strand, you get everything under that particular sixth grade math strand. And so on. On a full search, using all the dimensions established, you would get all the TLW's under a certain taxonomy level of a certain program goal, of a certain strand, of the 6th grade math curriculum.

See how it works?

The reason we must spend so much time debating this hierarchy set up is once the dimensions are established for any subject, they cannot be changed without re-entering the whole curriculum. Bounce this around up there in the big high school in the sky and then you or Ralph give me a call.
We, at Gilbert, would like to add another dimension, but Performance Plus only allows five levels after the subject level. We would like to add graduation outcome. Perhaps Program Goal is the appropriate level to use, but is it too low in the hierarchy? Would that matter?

Ashby

232-3744
October 18, 1993

To: Dave Ashby

From: Dick Manatt

I am travelling this week so I am taking this opportunity to get back to you. Shirley believes that you ought to combine strand and program goal. That way within each grade every time it is brought up you would have both the strand and the program goal.

That, of course, will only give you one field and we suggest you put the taxonomy level there. You might also use the code numbers to bring up the "flag" you want. For example, see item number 4 on the attached page where the essential skill in Arizona is included in the code number.

It may be that you have discovered some problems that we are not being told about by our NCS consultant down in Arizona! If you want to continue the dialogue get back to Shirley because she is here this week (294-5521).

RPM: cw

Enclosure
Please forward to Dick Manatt and Ralph Woodward. Thank you

To: Dick Manatt and Ralph Woodward
Re: Progress report from Ashby

Today is Thursday the 21st. This progress is report number 3. A few steps ahead and a few steps back. Ralph and I had the whole 6th grade math curriculum in the system. Two things cropped up. First, we assumed that the order of the units in the curriculum guide was the same as the textbook. Wrong! "Ass-u-me." Second, after meeting with the School Improvement Team and with the elementary faculty, we decided that grade level outcomes would be the most appropriate use of the "Program Goal" tier in the coding hierarchy. Either case means redoing the 6th grade curriculum. The actual typing in of the objectives etc. does not take that long. Maybe two hours per subject per grade. It is the slow painful process of making the up-front decisions that take the time. Going through this process so carefully will, hopefully, save much grief as we move to other subjects and other grades. The sixth grade teachers should have their recoding done by the end of this week and the fifth grade by the first of next week.

The next step in the process is the matching of the assessment items to the objectives. I plan to get some substitute teachers to allow regular teachers time to do the matching. First they will match the existing items to give them a feel for the process. Then it would be appropriate to have a Manattenizing/SIMing meeting for some inservice on test item development. This will prepare the teachers for developing their own new items and for pulling in items from outside sources.

When we have the existing items in the system, then we can begin the testing so Ralph can be getting some real data for his thesis.

Dave Ashby
October 14, 1993

Dick Manatt
Professional Studies

Dear Dick:

Thank you for all that you did to make the College of Education Open House such a great success. We have heard many favorable comments about the information shared and knowledge gained as a result of the efforts of all who contributed their time and talents to present the many programs and projects of the College.

This event provided us an opportunity to say how proud we are to be part of this great College and University. It also provided an opportunity to say "thank-you" to the Ames community for supporting our endeavors.

Your contributions to the Open House deserve special recognition. Thank you for helping us to build, within the College of Education, a Community of Concern.

Sincerely,

Norene Daly
Dean

c: Norman Boyles

Dick: Thank you also for being a part of Parents' Weekend.
Partnership Launched to Maximize Student Achievement

MINNEAPOLIS ... October 4, 1993 ... NCS Education, the School Improvement Model of the College of Education at Iowa State University, and Gilbert (Iowa) Community Schools have established a partnership to conduct action research centered on curriculum renewal, alignment, and assessment to maximize student achievement.

The project will include developing a Management Information System (MIS), which will provide educators in the Gilbert Schools with a state-of-the-art information system for planning and instructional decision-making at the classroom, building, and district level.

NCS Education, headquartered in Eden Prairie, Minn., will contribute software and scanning applications and training that will enable the district to manage assessment and instructional resource information. The new NCS Performance Plus™ software package will be used to manage all curricula and assessment activities to support mastery, teaching, and learning. Detailed reports provide students, parents, teachers, and the district's administration with timely and useful feedback.

"For over 30 years, NCS Education has worked to provide educators with innovative products and services for information management. We're excited about this unique partnership between K-12 and higher education institutions and NCS. We believe it will strengthen our capabilities and broaden our curriculum and assessment product offerings, to better respond to issues facing educators each and every day. We've come together to work toward a common goal – helping to ensure that our students succeed. This partnership is another way of taking on the challenge," says Luba Lewytzkyj, senior market manager of NCS Education.

The College of Education's School Improvement Model (SIM) office will contribute the research, technology, and experience gained from its 20 years of helping K-12 schools renew and align their
curricula, specify learner outcomes, and develop criterion-referenced and authentic assessment tests. The partnership offers SIM the opportunity to explore segmented or interval testing necessary for mastery teaching. In the past, SIM has specialized in pre and post measures to create gain scores for accountability.

Gilbert Community Schools, located just north of the Iowa State University campus, is a growing suburban district with 800 students. The district has a long history of joint ventures with Iowa State's College of Education. Gilbert students are supported by involved parents, a dedicated staff and board of education, and modern, attractive facilities at K-6 and 7-12 sites.

The teachers and administrators at Gilbert have the paramount role in the research partnership. Teachers will contribute time and teaching expertise to extend the present components and content of the Performance Plus package. They will experiment, revise, and advise as the Management Information System grows. Students, parents, administrators, and board members will be surveyed to determine ways to increase client satisfaction.

During the next few years, the partners will refine and pilot test the entire instructional delivery system via criterion-referenced measures for every academic subject at the elementary grades. Reports, journal articles, demonstrations, and exhibits will be provided for preservice teachers, professors, public and independent school staffs, and the public. Ever-increasing quality for educational excellence is the target set by the three partners.

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Present: Luba Lewytzkyj, Dave Ashby, Donna Holtan, Esther Martens, Ralph Woodward, Katy Rice and Dick Manatt

Purpose of Meeting: To finalize expectations, establish timelines and responsibilities and explore possible synergies on item bank development projects.

Goal: Establish a clear understanding of what each of us will do.

1. Introduction/Agenda Review

Luba introduced new members and reviewed the agenda.

2. Open House Summary

Rice reviewed the October 5 Open House feedback as well new developments relating to the Partnership for Change (Professional Development Schools Model).

3. Item Bank Project Discussions

Esther reviewed the ASSURE item bank revision process. In June NCS determined that a substantial amount of revising needed to be done. The revision process is now complete in math, science, reading and social studies (Grades 1-12); however, the item bank still does not reflect the high standards of NCS. The math is the best. The bank is a BASIC SKILLS ITEM BANK. There are no higher order thinking skills attached to this bank. There are no levels of Blooms Taxonomy. There are 10 items for every objective. The items relate only to knowledge and comprehension. The lower grades are very phonetically oriented. Graphics are mostly at the lower level with the exception of social studies (i.e., maps, charts). The remaining changes will be completed by December 15.

NCS has started creating new banks based on NCTM standards (which have just recently been completed). These new banks
are correlated to Bloom's Taxonomy. They will be done by February. Next year they will be doing science and social studies. Hopefully, this will be done by September, 1994--this depends upon when they finalize the national standards in science and social studies. Reading and English will not establish standards. The number of items per objective will depend on the national standards. Gilbert might pilot test these items.

4. Discussions on Synergies (incorporated in the rest of the minutes)

5. Progress Reports

Manatt reviewed progress from ISU's perspective. The major headway has been in the area of communicating the feasibility of accomplishing well-established curricula and test items in a shorter timeframe than what was previously thought.

Manatt would like to hold sessions this summer to train teachers and administrators in curriculum and assessment. This would be a two semester-hour seminar. This joint summer project needs more discussion. Manatt envisions this involving NCS/Gilbert/ISU. This will become an action item for the next agenda. Manatt also emphasized the need for authentic assessment training to give to teachers. The Gilbert and ISU are in the process of going after some grants to assist in paying the teachers for their time as well as providing training in the above-mentioned areas. Manatt asked how to handle the textbook items that are going into the system. To address this, a system of coding textbook items is being used.

Ashby reviewed progress made from Gilbert Elementary School's perspective. The demographic data, curriculum and courses are all in the computer. Ashby distributed examples of reports. Ashby will share information regarding refining the process with Luba. The week of November 22 Donna Holtan and Mike Korf will generate test items. Feedback from Ralph's and Daves experiences thus far--:

- The test generator is difficult to use; therefore they created a test item generation form.
• The system cannot be backed up--Joan has been contacted and the appropriate measures will be taken to fix the problem.

• Gilbert is finding that occasionally there are no outcomes hooked to objectives.

• The slowest part of the process was establishing what the structure would be--what would the hierarchy be?

• The guardian field in the demographic field needs to change--it assumes that there is only one head of household. Dave has created four fields to alleviate this problem.

• The structure is cumbersome and limiting. Dave and Ralph would add two more fields if the program allowed (it allows only up to 10 numbers/letters).

• It's too hard to change codes once they're input. Dave shared some suggestions to alleviate this problem. His suggestions revolved around creating menus to enable the user to select and click. The windows would include subject, grade and taxonomy.

• Printer compatibility needs to be addressed. A printer driver needs to be added.

• How does one tell the computer where a test item comes from?

• The NCS scanner is not very forgiving. Hopefully the new one will be more forgiving.

• On-line testing would really be helpful.

• The teachers are developing items based on enhancing textbook items and creating their own. They are developing a test per unit. Then these will be merged with the SIM test. This could be thought of as a formative test. Dave and Ralph are working on bridging these two sets of tests. SIM will then run an item analysis on Gilbert items and SIM items combined.
• ASSURE items could be shared with Gilbert for Gilbert to review and refine. This would give Gilbert more items and help NCS with improving the items. One of the better sections of the ASSURE program is math. This has also been cleaned up in terms of graphics. This clean up should be complete in the next two to three weeks.

6. Finalize Expectations/Determine Priorities

NCS expectations: Wants to focus on the publication side.
Mechanisms we could use:
ASCD
Education Leadership
School Administrators of Iowa
The Principal
Occasional Paper 94-1
Publications that Luba has access to
Background paper from Dick in February
Diary by Ralph
The Entrepreneur (business oriented)
Heartland, ISEA, IASB, SAI presentations by Dave Ashby-
spring and summer

7. Gilbert teachers' perspectives/concerns: Holtan is anxious to move forward on creating test items. So far, the progress has been good.

8. Letter of Understanding:

Luba will create the Letter of Understanding. The partners will accomplish finalizing this Letter by FAX/mail.

8a. Mission Statement Review: Tabled until January

9. Next meeting dates:

Grant writing meeting: Dick, Richard, and other(s)
Development activities meeting: Dave, Ralph and other(s)
Other activities can take place by phone
After Christmas we can schedule a meeting to address future seminars
Action Items:

1. Spring seminar(s): Dick will let Luba know what his spring schedule is like. February through May could present opportunities for short seminars—Luba and Dick will brainstorm these opportunities by mid-December.

   Summer seminar: June 6-10 (mornings only)—for 2 graduate credits. Districts who are likely to use this would be invited. Dick will move forward on this. Dick will establish a set of criteria and confirm this by January. Check into "comping" teachers and how many teachers from Gilbert would be interested in attending. Luba will also look into obtaining grant money to help.

2. Contact Lynn Glass for information on benchmarks for national science standards. Dick or Katy will contact and send to Esther immediately.

3. Luba would like to look at the Arizona and Florida curriculum. Dick will send Luba a sampling of these curricula from different states by the end of December.

4. NCS would like to become involved from the ground floor in a new project. As Dick gets the award he will let Luba know.

5. Luba will send us information on instructions for
   - The pizza pack (observation forms)
   - The custom forms used for composition and other OBE activities in December

6. A future meeting needs to be devoted to set out specifications on MCAT. This meeting will involve Dave and Ralph as well. The subject will be ongoing into 1994, with a possible meeting in December or January. Joan Hansen will take care of this.
7. Dick would like hard copy of the ASSURE items to incorporate into the 5th and 6th grade math, review and run an item analysis. The hard copies will go to Ralph. Dick Manatt and Richard Dyches will talk this over by phone. Jeff Vorwald will get math to Ralph in December. Esther will contact Richard for approval.

8. Dick and Ralph will calculate the number of items in SIM/district banks. SIM will also need to calculate the per item cost. As soon as SIM can.

10. Dick will check the feasibility of pilot testing NCS new item banks through ISU by various districts in Iowa. Dick and Richard Dyches will cover item development, shelf tests, pilot testing and statistical analysis/standard exam analysis among others. Richard Dyches will contact Dick between December 1 and 8.

11. Dick will send a copy of the Guam proposal to Luba. The Critique Handbook and Social Studies test from the Wyoming project will also be sent. Dick will take care of this right away.

12. Joan Hansen will call Dave Ashby regarding the language issue (i.e., discrimination) by Friday, November 19, 1993.

13. Michelle will get back to Dave Ashby regarding the printer driver.

14. Ralph will send Luba the most recent copy of the bridging document.

15. In March the Partnership will submit a paper to the ASCD "Call for Papers"

16. The Partnership will pull together an action item to work in the vocational technical area.

17. Dick will send Luba a copy of Gary Schnellert's dissertation. (at Dick's convenience).
18. Dave will get on the agenda for presentations regarding the Partnership to associations in Iowa. Dave will contact the other partners regarding their role in these presentations.

19. NCS will provide the Partnership with the new Performance Plus software when it becomes available. The timeline on this is unclear. NCS will know better by the end of December.

20. Gilbert can put more subjects in the current platform. Gilbert will take social studies next and then align itself with what NCS is doing.

21. Digital image scanner: Luba will follow up on what works with Performance Plus during December.

22. Dick will need a letter of support for the grants he's writing in the area of curriculum. This can be done once Dick and Richard talk. Esther will follow up on this. Dick will FAX an outline asking for specific information in this letter of support.

23. Gilbert needs to provide a letter of support.

24. Luba will send a Letter of Understanding in December. Need to address institutionalizing the process.
Date: Wednesday November 17, 1993  
Place: Owatonna Forms Plant

Time: 9:30 a.m. - 3:00 p.m.

Participants: David Ashby, Kay Christianson, Richard Dyches, Joan Hansen, Luba Lewytzkyj, Dick Manatt, Katy Rice, Jeff Vorwald, Gilbert teacher

Meeting Facilitator: Luba Lewytzkyj

Purpose of Meeting: To finalize expectations, establish timelines & responsibilities, and explore possible synergies on item bank development projects

Desired Outcomes: For all partners to agree to responsibilities and timelines, determine feasibility of joint efforts on item bank projects.

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<th>Agenda Items</th>
<th>Person Responsible</th>
<th>Time Allotted</th>
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<tbody>
<tr>
<td>1. Introduction /Agenda Review</td>
<td>Luba</td>
<td>5 min.</td>
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<tr>
<td>2. Open House Summary</td>
<td>Katy</td>
<td>5 min.</td>
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<tr>
<td>3. Item Bank Project Discussions</td>
<td>Richard</td>
<td>30 min.</td>
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<tr>
<td>4. Discussions on Synergies</td>
<td>All</td>
<td>30 min.</td>
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<tr>
<td>5. Progress Reports</td>
<td>All</td>
<td>30 min.</td>
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<tr>
<td>6. Finalize Expectations/determine priorities</td>
<td>All</td>
<td>30 min</td>
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<tr>
<td>7. Gilbert teachers' perspectives / concerns</td>
<td>Dave</td>
<td>15 min.</td>
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<tr>
<td>8. Review Letter of Understanding</td>
<td>All</td>
<td>30 min.</td>
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<tr>
<td>9. Lunch (11:30-12:30)</td>
<td>All</td>
<td>60</td>
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<tr>
<td>10. Forms Plant Tour</td>
<td>All</td>
<td>90 min.</td>
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<tr>
<td>11. Wrap / Summary (by 3:00)</td>
<td>All</td>
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Action Items:
1. Prepare progress reports on: Gilbert's item matching, Bd of Ed. meeting, SIM teacher session status.
2. Review draft of Letter of Understanding. Luba will fax this wk. Pls bring your comments / suggestions.
3. Richard- pls be prepared to provide overview of item bank project. Brainstorm on joint possibilities will follow. Pls confirm your attendance also.
4. Dick. Pls be prepared to contribute your thoughts on how we might pull together on item bank projects.
5. Katy. Will you please agree to scribe again?
6. Katy. Pls update me ASAP regarding attendees from your end.

Safe Travels! See you next wk!
November 23, 1993

Joe Millard  
Educational Services Division  
Heartland AEA 11  
6500 Corporate Drive  
Johnston, Iowa  50131

Dear Joe:

Attached you will find the application for a Partnership for Change Project from the College of Education, Gilbert Community Schools and National Computer Systems. We have also submitted our materials to Ted Stilwill in hopes of enlisting the Iowa Department of Education's support with this project. We continue to work hard at moving this forward and are very excited about the impact this has on transformation!

Please call me if you need further information or have any questions. Thanks for the opportunity to become a Partnership for Change project.

Sincerely,

Katy Rice

/kfr
Attachment

c:  Les Sternberg  
    Norene Daly
PARTNERSHIP FOR CHANGE INFORMATION

Name of District, AEA, or College: Gilbert Community Schools, SIM, ISU, College of Education/ NCS Corp.

Information Contact Person: Dick Manatt / Dave Ashby / Katy Rice

Telephone Number: 515-294-5521 / 515-232-3744 / 515-294-1269

I. Areas of interest or expertise that you would be interested in developing for future collaboration or Partnership programs:

1. Curriculum Renewal/Alignment
2. Curriculum Driven Assessment
3. Criterion Referenced Testing
4. Authentic Assessments
5. Teacher Empowerment

II. If you have an active program about which you would like to share information, please complete the following.

Name of the active program: Instructional/Management System/Performance PLUS

Targeted population:
- Grade level or age: K-6
- Content or subject area: Mathematics

Description of the active program:
We are using the nationally developed and validated system called the School Improvement Model II to review our K-6 curriculum and are managing all assessments and reports via NCS's Performance Plus.

Person to contact for further information about the active program:
Contact Name: Dave Ashby
Telephone Number: 515-232-3744

Position: Principal - Elementary School
School District: Gilbert Community Schools
School Building: Gilbert Elementary Building
Address: 109, Bornmore Street
City: Gilbert, IA
State: Iowa, Zip: 50105

Continued on reverse...
III. Information about ongoing Partnership programs.

Name of the Partnership program: Maximum Student Achievement

Targeted population:

Grade level or age: K-6
Content or subject area: All Subjects

Description of the Partnership program:

NCS Education, Gilbert Community Schools and the School Improvement Model of
Iowa State University have established a partnership to conduct action
research on curriculum renewal, alignment and assessment to maximize
student achievement.

Person to contact for further information about the Partnership program:

Contact Name: Nick Manatt
Position: Director, School Improvement Model
School Building: College of Education, Iowa State University
Address: N239 Lagomarcino Hall
City: Ames, Iowa, Zip: 50011

Return form to: Joe Millard, Educational Services Division, Heartland AEA 11, 6500 Corporate
Drive, Johnston, Iowa 50131.
MEMORANDUM

TO: Educators Interested in the Partnership for Change

FROM: Joe Millard, Director, Heartland Educational Services

DATE: May 8, 1992

SUBJ: Formation of the Partnership for Change

Persons representing educational institutions who were interested in forming a partnership among the local school districts, Heartland AEA and Iowa State University met May 1, 1992 at the Starlite Inn, Ames, Iowa. Those in attendance were: Gary Downs, Iowa State University; Sue Z. Beers, Roland-Story and Gilbert; Jennie Johnson, Ankeny; Jim Almquist, ISU Extension; Barb Licklider, ISU; Dick Zbaracki, ISU; David Owen, ISU; Dale Ball, Madrid; Barry Green, Madrid; Dale Henricks, Roland-Story; Sam Chiodo, Orchard Place, Des Moines; Norene Daly, ISU; Carroll McCluckie, South Hamilton; Diane Blackwelder, ISU; and Joe Millard, Heartland AEA.

The guidelines of the Partnership for Change were approved with some minor changes. The revised guidelines are attached. A Partnership for Change brochure and request for membership is being developed and will be mailed to all AEA 11 school districts, colleges and universities in AEA 11.

The Coordinating Committee was given the responsibility to develop a proposal form for developing partnerships. The following directions were given to the Coordinating Committee:

1. Members may submit a full partnership request or a request for matching resources with needs.

2. These requests should be reviewed by the committee, with assistance from a review team composed of members.

3. All requests are to be reviewed and the committee, or review team, should assist in facilitating requests. Members, not the Coordinating Committee, will decide the degree of involvement.

4. Requests are viewed as opportunities for members to work together.

5. Requests may be submitted by any of the members. At this time, memberships include local school districts, Heartland Area Education Agency, or Iowa State University.

6. The Partnership should begin small and facilitate at least one request this fall. (Something should be in place by October 1992.)

7. The Coordinating Committee should develop and facilitate a clearinghouse that will collect and disseminate findings to all members.

8. The Coordinating Committee will need to review progress, in light of the guidelines and benchmarks, and report back to the entire membership.

/ss
December 17, 1993

Bob Bowen
President of Education
National Computer Systems
11000 Prairie Lakes Drive
Eden Prairie, MN 55344

Dear Mr. Bowen:

I would like to take this opportunity to thank you and National Computer Systems for your commitment to education. The partnership among National Computer Systems, Iowa State University and Gilbert Community Schools is very unique. We are very excited about the impact of this partnership on student achievement in Gilbert and the potential for similar partnerships impacting schools nationwide.

One rarely finds such a successful collaboration between business, higher education and PK-12 education! We are extremely fortunate to have Luba Lewytzkyj, who has engineered the project, working for our school district, Iowa State University and National Computer Systems. It is difficult to find a business partner who has the knowledge base and understanding of education that Luba has, particularly in the area of curriculum. She keys in on barriers that educational organizations face and addresses those barriers positively and realistically.

The partnership members have met twice. During the two meetings we accomplished creating a statement of our mission, a formalized list of expectations from each partner, timelines for "next steps", and future meeting/seminar agendas. As you can see, with Luba's leadership this group accomplishes a great deal in a short amount of time.

From Iowa State University's perspective, the link between fourteen years of research and activating that research through technology is very exciting! The Board of Education (Gilbert Community Schools) is looking forward to receiving student achievement data which will help them focus in on areas of strength and areas for growth. The Gilbert school staff are looking forward to the day when a management information system will allow them more time to teach, and ultimately will decrease the time required to do less meaningful tasks.

The most important contribution a person can make, however, is a sincere desire to make an impact on the education and future of our students. You can have the organizational skills and knowledge of content, but not the "fire in your gut" to make a difference. Luba has the "fire in her gut" and we are extremely excited that she and NCS are making a difference!

Sincerely,

Katy Rice
Board Member, Gilbert Community Schools
Assistant to the Dean, College of Education

c: James Bray
Kay Christianson

bc: Luba Lewytzkyj
PARTNERSHIP FOR CHANGE
GUIDELINES
Adopted May 1, 1992

Mission

The Partnership For Change is committed to improving teaching and learning for all students.

Goals

Share information, explore alternatives, and confront challenges and issues in a manner that promotes collegiality and trust.

Support the idea that ideas for research and/or application may be proposed by any of the partners.

Philosophy

We believe that the nation is in a period of educational reform and hold that the national reports and state mandates demonstrate the need for improvement.

We believe that greater collaboration among schools, educational agencies, and university-based teacher education programs is essential and achievable.

We believe one outcome of enhanced collaborative efforts will be that teachers-researchers-educators are better able to interpret, initiate, and carry out meaningful changes in local settings.

We believe that a true partnership of local schools, Iowa State University and Heartland AEA is possible. Local schools, the university and the AEA are equal contributors, each benefiting according to the needs of the organization.

The partnership, as a whole, includes schools and their communities reflecting the populations of a pluralistic society, representing a variety of geographic sites and diverse populations.

Benchmarks for the Partnership for Change

Preamble

The mission of the Partnership for Change is a commitment to improve teaching and learning for all students. Through jointly planned and implemented local collaborations, the Partnership will share information, explore alternatives, and conduct research which we believe will improve the quality of education.

Partnerships between local schools and universities have occurred for years. As profitable as they may have been, we believe that the Partnership for Change we are promoting offers some unique dimensions. We want it to be a true sharing of ideas and staffs. It acknowledges that there are different but equally valued types of expertise at local schools, the AEA, and Iowa State University. Essential to the success of the Partnership is collaboration for everyone. Staff development is required. Students in the local schools and at the university (the undergraduates who will become teachers; the graduate students who will become administrators, counselors, and curriculum specialists) will mutually benefit from extensive interactions.
Other features or components of this Partnership are: an expanded definition of the community, the need for research and assessment to be jointly planned, and the agreement that substantive changes mandate a long-term commitment.

The Partnership for Change is multifaceted. That is, the Partnership (capital P) is made up of all those who accept the benchmarks described in this document. At any one time, only some of the members will be actively engaged in specific collaborations. The Partnership will hold periodic meetings and provide a network of communication for those interested in nurturing quality collaborations among local schools (LEAs), the Area Education Agency, various social and educational groups, and higher education institutions. Yet within the larger Partnership will be opportunities for contracts to be developed between individual partners. Indeed, based on the experience of others, we insist that each proposed collaboration develop a specific contract.

**Team Planning**
- Organize for each collaboration within the partnership a team including an LEA teacher, administrator and others as appropriate; AEA representative; and ISU faculty administrator and students.
- Determine specific ways to enhance the educational environment (a strategic plan).
- Prepare a contract, which includes goals, budget, facilities to be used, number of individuals involved, length of commitment, etc.

**Faculty-Staff Interactions**
- Form a cohort of ISU faculty to work in an LEA for an extended period of time.
- Agree that LEA and AEA faculty will serve as ISU adjunct instructors.
- Appoint LEA members to appropriate College of Education committees; appoint ISU faculty and students to appropriate LEA and AEA committees.

**Jointly Planned Research**
- Identify nature of research questions to be explored.
- Determine specific action research activities.
- Develop grant proposals.
- Conduct research together.
- Disseminate findings of research cooperatively through publications and presentations.

**Staff Development**
- Offer inservice seminars to all members of individual collaborations and the total Partnership when appropriate.
- Choose seminar facilitators from all members of individual collaborations (LEAs, AEA, and ISU).
- Extend pedagogical repertoire.
- Model good teaching.
- Develop new skills for supervision and feedback.
Variety of Pre-Service Educational Experiences

- Form cohort groups of pre-service teachers, graduate students, businesses and foundations, to work in LEAs with cohorts of local educators.
- Offer several grade levels, buildings, and/or other opportunities so that ISU students can work with diverse learners.

Jointly-Determined Assessment Procedures

- Determine the PreK-12 student outcomes and assessment procedures needed in the specific collaboration.
- Evaluate curricular and programmatic impact of partnership (degree of implementation studies).
- Monitor progress of pre-service educators involved in Partnership activities.

Membership in the Partnership for Change

Membership in Partnership For Change is open to all Iowa public and non-public schools, universities, area education agencies, colleges, community colleges, and organizations and institutions that are committed to improving teaching and learning for all students. LEA memberships may be by district or building. (Districts may purchase multiple memberships.) One set of materials will be provided per membership.

Annual Membership Fees

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<td>Iowa State University</td>
<td>$500.00</td>
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<td>Other Colleges, Universities, AEAs</td>
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<td>Businesses/Foundations</td>
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One set of materials is provided per membership.

Member Benefits

- Holmes Group Forum
- Bibliographies and Additional Materials
- Video of PFC
- Professional Development Meeting
- Provide Direction for the Future
- Information on How to Form Partnerships
- Networking
- Opportunities for Developing Joint Proposals

Coordinating Committee

Coordinating Committee members are selected by the membership and serve a three-year term.

1. Three representatives from Iowa State University, selected by university personnel.
2. Three representatives from local school districts, selected by the local school members of the partnership, represent the geographic sites and diverse populations.

3. One representative from the Heartland Area Education Agency.

4. ISU Dean is an ex officio member of the Coordinating Committee.

The membership of the Coordinating Committee is reviewed yearly to reflect all partnership members. Vacancies occurring during the year will be appointed by the Coordinating Committee for the remainder of the year. At the conclusion of the year the representative group will select an interim appointment.

The purpose of the Coordinating Committee is to manage the relationship among partners. Such items may include, but are not limited to, the following:

1. Plan and convene meetings of the partners.
2. Serve as a clearinghouse for information.
3. Create a structure to facilitate interaction among the partners.
4. Develop guidelines and criteria for membership.
5. Seek and assist in developing grant proposals.
6. Develop and maintain the membership guidelines.
7. Develop budget and fee structure.

Officers for the Partnership are selected from the Coordinating Committee.

The Heartland Area Education Agency representative will serve as the recording secretary.

The Coordinating Committee will select co-chairs to serve for two years. The Iowa State University representative will select a university representative as one co-chair, and the local school district representative will select a LEA representative as a co-chair. One co-chair will serve as a lead chair and the other as the assistant chair. The second year, the assistant chair becomes the lead chair and the new co-chair serves as the assistant. The chair will rotate between the university and local school co-chair.

Steering Committee

The two co-chairs and recording secretary are identified as the Steering Committee. The Steering Committee will set agendas for the Coordinating Committee, draft guidelines, review and authorize the general operation of the Coordinating Committee.

Operating Year

An operating year is defined as the fiscal year from July 1 through June 30.

Fiscal Agent

Iowa State University will serve as the fiscal agent.
Budget

The Coordinating Committee will develop a yearly budget and present it to the membership prior to July 1 for approval. The Coordinating Committee may revise the line item budget staying within the approved total.

Contracts

Members in this Partnership will seek opportunities to develop full professional development schools. When entering into a professional development school agreement a specific contract between Iowa State University and participating LEAs will be developed. These contracts will be detailed and approved by the participating institutions. A 28-E agreement may be necessary when contracting among the various members.

The Coordinating Committee, Steering Committee or membership at large cannot contract or make legal commitments for the organizing bodies. (See Benchmarks of the Partnership for Change for detailed explanations of full partnerships.)
November 30, 1993

Ted Stilwell, Interim Director
Iowa Department of Education
Grimes State Office Building
Des Moines, Iowa 50319

Dear Mr. Stilwell:

At the IASB conference held on November 18 and 19, I spoke with you briefly regarding the partnership between Iowa State University, Gilbert Community School District and National Computer Systems Corporation. As I indicated to you at that time, we are very excited about the impact of this partnership on student achievement in Gilbert and the potential for similar partnerships impacting schools statewide and nationwide.

With the assistance of Dick Manatt (School Improvement Model, College of Education, ISU), David Ashby (Gilbert Elementary School) and Luba Lewytzkyj (National Computer Systems, St. Paul, MN), I have put together the information you requested regarding the partnership.

Through the work of the School Improvement Model, we discovered that curriculum alignment, curriculum renewal and criterion-referenced/authentic assessment would raise student achievement and keep it up (see the Manatt-Holzman Report). This work has been repeated in Florida and Arizona (see Occasional Paper 93-1). The approach avoids the pitfalls of TQM (see "Let the Buyer Beware") and the wrath of the anti Spady/OBE groups (see "Why is the Religious Right So Unhappy with Public Schools?"). The curriculum renewal/testing development process created by SIM has been aligned to national standards, recommendations to the scholarly societies, state outcomes and the most popular norm-referenced tests.

The SIM team decided that Iowa needs a small district to lead the way in applying this research. The College of Education built a "Holmes Group/Professional Development Schools/Partnership for Change" initiative to show how schools can be transformed at a low cost and efficient pace. To do that, SIM needed to create an approach to curriculum-driven assessment which is relatively inexpensive and microcomputer-based.

Gilbert Community Schools, the National Computer Systems Corporation and the School Improvement Model have combined to create a model for Iowa and the nation
(see Enclosures 1 through 5). We are hoping that you may be able to help us finish the job--routinize the process and share it throughout Iowa.

Please look over what we have done. If you have any questions, you may call me at 294-1269 (work), Dick Manatt at 294-9995 (work) or 232-0202 (home), or David Ashby at 232-3744 (work). The expertise in research and application, of course, lies with Dick or David. We look forward to your response.

Thank you very much for the opportunity to present this to you.

Sincerely,

Katy Rice
Gilbert Community Schools

c: Dick Manatt
   Dave Ashby
   Doug Williams
   Luba Lewytzkyj
   Ralph Woodward
TO: Joan Hansen and Luba Lewytzkyj

FROM: Dave Ashby

phone 515-232-3744 fax 515-232-0099

Please receive 3 pages including this cover page

I thought you might be interested in the test format we developed for 6th grade. It allows them to do their work on the test booklet in case the teacher wants to check the student's work. Showing the work will also help us to detect the kinds of errors students are typically making so we can improve the quality of the answer foils.

Joan: I made a nice ASCII file of a sample test and brought it into a word processor, but cleaning it up and reformatting it would take too much time. Also there is the hazard of fat fingers introducing errors. We think this format will work allowing us to stay with the test generator.

Have a cool Yule
INSTRUCTIONS

Please read the instructions for each question type and mark or record your answer as instructed on your NCS score sheet. Use only a #2 pencil to mark your answers. Show your work in the space provided.

MULTIPLE-CHOICE INSTRUCTIONS

Mark the response that represents the best answer to the question.

1. Select answer: !
   !
   !
   !
   !
   A. .1776
   B. 19.16
   C. 17.76
   D. 16.76

2. Select answer: ! 4.6 x 0.3 =
   !
   !
   !
   !
   A. 138
   B. 1.38
   C. 13.8
   D. 0.138

3. Select answer: !
   !
   !
   !
   !
   A. 8.352
   B. 7.952
   C. 8.252
   D. 83.52
4. Select answer: 
   \[ 0.50 \times 0.2 \]
   A. 0.010
   B. 0.100
   C. 10.0
   D. 0.001

5. Select answer: 
   \[ 0.121 \times 0.4 \]
   A. 0.0484
   B. 483
   C. 4.81
   D. 48.4

6. Select answer: 
   \[ 0.03 \times 0.4 \]
   A. 0.12
   B. 1.2
   C. 12
   D. 0.012

7. Select answer: 
   \[ 0.87 \times 10 = \]
   A. 8.7
   B. 87
   C. 870
   D. 0.087
TO: Les Sternberg, Associate Dean  
College of Education

FROM: Dick Manatt, Professional Studies

DATE: January 10, 1994

RE: "Courtesy Scholarships" for our Gilbert School District Partners

As part of our college/business/school partnership, we would like Gilbert Elementary School teachers to attend the seminar, Ed Ad 615, "Teachers as Leaders in Goals/Standards/Assessments-driven School Reform," to be offered June 6-10, 1994. (Two semesters of Graduate Credit).

Les, this is to confirm our discussion of last Tuesday. Professor Stow and I will be offering the seminar in June as a SIM contribution to the College's offerings. No salary will be involved--it's during the interim and we will both donate our time as part of the College /Gilbert/NCS Partnership.

When we talked, I asked about five complimentary scholarships--now the interest has gone up to ten! Not surprising, I guess--it's a good program and people love a free opportunity. Tuition would be $290.00 each. What can we offer?

I understand that you agreed to five and I appreciate your generosity--can we do anymore?

RPM: cw

/cc: Mrs. Katy Rice
Enclosure
Date: January 24, 1994

To: Doug Williams, Superintendent
   Gilbert Community Schools
   Gilbert, Iowa  50105

From: Dick Manatt

Re: Ed Ad 615 Seminar, June 6-10, 1994

Our plans for the Summer Seminar are progressing well. Each of you has told me that you want to send selected personnel to the seminar described in the Attachment #1. Housing and food service costs are contained in Attachment #2. (Doug, I realize your people will commute from home!)

Our business partner NCS -- Education, has offered to host a social function on Sunday night, June 5th to get acquainted.

Remember this seminar is by invitation only -- I don't expect more than 25 participants plus Professor Stow, myself and Ralph Woodward. Our mission is to serve well -- in future years we will open up to outsiders.

Tuition may increase from $290 to $304 (approximate). Remember, our legislature is in session and budgets are "fluid" at this point. [Harland Miller, a famous columnist for the Des Moines Register once said, "When the legislature is in session no Iowan's life or property is safe!"] I'm not sure if that includes Hoosiers, Minnesotans, and Kansans?

Seriously, the SIM team and the Business partnership of the College of Education, Gilbert Public Schools and NCS - Education are very excited about this opportunity. We're starting something very big!

Formal registration materials will follow. Cheers!

cc: Katy Rice
    Dave Ashby
    Shirley Stow
    Luba Lewytzkyj
    Ralph Woodward

Enclosures (2)

RPM: cw
New goals for American education are being set by curriculum and achievement standards. New national curriculum standards and recommendations for assessment have been published in mathematics and science; they are underway in all other core academic subjects. States and many local school districts are revising their curriculum frameworks and assessment programs to be consistent with national education GOAL THREE which calls for competence in challenging subject matter for all students. The hope is that these curriculum and student achievement standards will encourage teachers to bring their instruction into alignment with the new curriculum standards and that student performance will rise to meet the new achievement standards.

Unfortunately, all of this won't happen by osmosis or good intentions! Curriculum renewal with the new standards and use of the assessment recommendations of the various scholarly societies is hard work and intellectually demanding. It can't be done by teachers working solo in their classrooms.

Dick Manatt and Shirley Stow, co-directors of the School Improvement Model (SIM) Office at the College of Education at Iowa State University have assisted teachers in leading this process nationwide since 1978. In a series of two semester hour summer seminars, they will take one subject at a time and prepare teachers to serve as in-district leaders for the curriculum renewal process. Mathematics will be the target subject for summer 1994. Science will be addressed in June 1995.

Teachers from your district are invited to bring your existing mathematics curriculum and go through the following process:

1. Examine the new standards recommended by the Commission on Standards for School Mathematics (1989).

2. Compare your district's scope and sequence of learner outcomes with the standards-enriched curriculum materials developed by the SIM Office.

3. Modify, enhance, and rewrite the learner outcomes for your scope and sequence.

4. Use the "bridging" techniques developed by Ralph Woodward of SIM Office to link your new learner outcomes to test items provided by SIM.
(5) Write additional test items to supplement what is available in order to create a prototype diagnostic pretest to use with your own class(es) next September.

(6) Exchange test items with other seminar participants to increase your "library" of assessment items.

(7) Explore various "packages" to computerize your new curriculum/assessment system.

(8) Pilot test your new array of assessment items with your classes.

(9) Return the test scanforms for analysis and critiquing using the Standard Examination Analysis program at the ISU Durham Computation Center.

(10) Receive feedback from professors Stow and Manatt regarding ways to improve your assessment items.

SEMINAR DETAILS

The seminar will be held Monday through Friday, June 6-10, 1994. In the mornings, participants will receive large group training on how to do curriculum renewal and alignment. Each afternoon will be devoted to laboratory work on curricular outcomes and assessment. You will need your school's curriculum guides as a starting point. Some clerical assistance and a few computers will be provided. Bring your own laptops and any disks of curriculum materials you want to revise.

COSTS: $290.00 for two semester hours of graduate credit. NO EXTRA CHARGE FOR OUT OF STATE PARTICIPANTS. Materials notebook, $24.00. Scoring, analyzing and feedback for the tests created, $30.00 for each class pilot-tested. Inexpensive, air-conditioned dormitory lodging is available. Motel rooms are plentiful.

The seminar may be taken for a letter grade or on a satisfactory, not satisfactory basis. Let us know which you prefer.

IDEAL PARTICIPANT GROUP -- teachers, K-12, knowledgeable in mathematics. Principals and curriculum experts are welcome -- but, remember, the thrust of the seminar is teachers as leaders in Goals/Standards/Assessment-driven school reform!

FOR MORE INFORMATION CALL OR WRITE:

Dick Manatt
Professor of Education
N229 Lagomarcino Hall
College of Education
Iowa State University
Ames, Iowa 50011 Tel. 515-294-9995
A6 - The Daily Tribune, Tuesday, January 25, 1994

THE DAILY TRIBUNE

NEIGHBORS

Computing a new teaching method

By KAREN ISU
Tribune Correspondent

Right before winter break, Donna Holtan gave her sixth-graders at Gilbert Elementary School a test on multiplying decimals.

This wasn't your basic end-of-the-year math test, however. After the students filled out the bubble sheets, Holtan took the tests to Principal David Ashby's office, and Ashby ripped them through a bread loaf-sized scanner hooked up to his computer. Minutes later, Holtan had printouts for her sixth-graders that told them which objectives they mastered and on which ones they needed more work. Another printout compiled results from the entire class for Holtan to see what she needed to re-teach.

"You can really zero in on what skills you need to help them (with). I've seen printouts of the results to the parents," Holtan said.

This math exam was an example of criterion-referenced testing. Instead of the classic norm-referenced tests which compared student scores with each other, criterion-referenced testing compares individual scores to a predetermined level of mastery.

For feedback after a game or meet, today's athletes turn to a stack of statistic sheets. Now Gilbert Elementary hopes to bring that type of feedback into the classroom.

"These youngsters will get as much feedback from their learning as they do now in their athletic endeavors," said Richard Manatt, an Iowa State University College of Education professor.

With the help of Manatt and Gilbert School Board member Kaye Rice, Gilbert Elementary has entered into a three-way partnership with the College of Education and National Computer Systems to implement an instructional management system by the year 2000.

The program provides precise monitoring and feedback of student academic progress and makes suggestions for homework, re-teaching, quick reporting and other things necessary to properly use the mastery teaching model. National Computer Systems, headquartered in Eden Prairie, Minn., has contributed software and scanning equipment and has provided training that has enabled the district to manage the information. NCS also has contributed an enormous amount of time and commitment," Rice said.

Manatt has been working on perfecting the criterion-referenced testing since 1978. He has introduced this computer-assessment system to schools as far away as Tokyo, Japan and Taipei, Taiwan, as well as schools closer to home in Minnesota, Wyoming, Florida and Arizona.

During the next few years, the three partners will test and refine the criterion-referenced management system for every academic subject in the elementary grades. Gilbert Elementary used math as its starting point and will eventually include subjects such as social studies and language arts.

"With this type of testing, we can show youngsters their progress and achievement, and it teaches the teachers to work smarter. It saves the teacher time and gives better feedback to the kids," Manatt said.

"The testing replaces the traditional grades with a more detailed assessment of the student's progress," Ashby said.

"The difference is the teachers establish objectives and say 'This is what we expect students to learn.' The computer system allows us to do that by using carefully designed assessment tests to match those curriculum objectives and goals."

At Gilbert Elementary, teachers give out report cards to fourth- through sixth-graders every quarter and have parent-teacher conferences after the first and third quarters. With the new system, Ashby said that "if a parent calls us and asks 'how's my kid doing?', I can say 'Just a minute. I'll punch up a report and send it home today'!

Even though it is still in its developmental stage, administrators and teachers are optimistic about the program and hope it will be a model for districts statewide and nationwide," Rice said.

"It takes a lot of time upfront to specify the curriculum, learner outcomes and learning sequence. After that, the use of the computer system saves teachers, students and administrators' time," Manatt said.

Students were excited because they knew it was a different type of test and that they could have the results back very shortly," Holtan said.

Although the results were known immediately after a test was taken, it took Holtan and Mike Korf, the other sixth-grade teacher, a day to prepare 50 test questions and answers "because they want to have answers which are typical mistakes so they can use it for diagnostics." Ashby said.

To produce the test, they carefully define the content area and the skill or knowledge to be measured. They wrote the questions to match the skill or knowledge area definition and chose a sufficient number to provide an adequate indication of mastery.

Ashby attributes the initial success of the program to the cooperation and attitude of teachers.

"The commitment of the teachers is crucial. It doesn't all fit into their paid time but our hope is that we get some money for teacher inservice time and time to work on development test items. Right now they are dedicating their extra time to get the program started," Ashby said.

Teachers have stayed after school for 10 hours of instruction in five inservice sessions to learn about the program and how to write test questions. The district is applying for a $70,000 federal grant from the Fund for the Improvement and Reform of Schools and Teaching. The grant will help to buy a digitizer, which scans in artwork for the tests.

Because of its early success in its developmental stage, Ashby anticipates that full implementation in elementary grades (K-6) will take three years. Which is before the target of year 2000. The scanner is currently hooked to only one computer. In the future, the scanner will be placed in the media center and the program will be on the network so every teacher will have access to it from his or her room.

The Gilbert School Board has been supportive of the new venture.

"Two of the board's goals directly correlate with the partnership," Rice said. "They have committed to investing in beginning to implement innovative practices for instruction, staff collaboration and development, and developing partnerships with businesses, community and higher education. This partnership directly helps us through getting the resources from NCS an ISU, both financial and intellectual. The system provides a sound mechanism for assessing achievement and assist in tracking progress toward our goals.

This type of testing hopes to improve the teacher and the student.

"It's not just for the teacher and the way they teach. It's also for the student and the way they learn. They learn about how they learn and the mistake they make. If a student chooses a wrong answer, you could show it right back to the student and tell them. 'You probably did this and that's probably why you got this answer.' It's a much better positive feedback than 'you got a D or a B.'" Ashby said.

District administrators hope to see also applied in the secondary school.

"I would guess that it isn't too far away when seventh- and eighth-graders get involved with this. The big challenge is the big change for high school now, the high school than ABCDF and thinks that colleges think ABCDF grade point average and classification. That's not just a little Gilbert problem, that's a nationwide problem," Ashby said.

School board member Katy Rice, superintendent Doug Williams, teacher Mike Korf and principal Dave Ashby look over test results produced with the new equipment being used at Gilbert Elementary.

Daily Tribune/DOUG SMITH
March 28, 1994

Mr. Richard Dyches
Director of Testing, NCS Education
11000 Prairie Lakes Drive
P. O. Box 9365
Minneapolis, MN 55440-9365

Dear Mr. Dyches:

We're coming along well with our plans for the June 7-11 sessions in Gilbert.

As discussed at our February meeting in Ames, I would appreciate your assistance with the upcoming June sessions as follows:

1. Please fund the agreed-upon six scholarships at $305 each to cover the cost of the 2-credit hour course taught by Richard Manatt and Shirley Stow (total of $1830). Payment would need to be made to Iowa State University.

2. Please fund a wine and cheese reception at the Valhalla Restaurant in Story City. The anticipated number is 40 and the cost is approximately $10-13 per person (total of $400-$520). Payment can be made directly to Valhalla Restaurant (Mr. Jerry Erickson) the night of June 7th. Mr. Erickson would prefer payment by check if at all possible. Otherwise, they do accept VISA, MasterCard and American Express.

We have reserved rooms for the participants at the Super 8 Motel at I-35 and Broad Street in Story City. The cost is $39.47 (tax included) per night. All Ames hotels are booked due to a Methodist convention that week! We need to know how many rooms you need and for what night(s) as soon as possible. 

Please confirm the above at your earliest convenience. My phone number is 515-294-1269 and my FAX number is 515-294-9725. We're very excited about this endeavor and look forward to working with you to make this a success! Thanks a million for your support...

Sincerely,

Katy Rice
Assistant to the Dean, College of Education

c: Dick Manatt
Norene Daly
SUBJECT: If you need any further help please let me know. Thanks,

Tammy Fulton
612-829-4994
April 7, 1994

Ms. Katy Rice
Iowa State University
College of Education
Office of Dean
Ames, IA 50011

Dear Katy:

I received your fax of March 28. I am today indicating a check request to Iowa State University for $1830.00 for 6 scholarships. You can expect the check in about 2 weeks.

I will also issue a check request for $520 to Calhalla Restaurant. I would greatly appreciate your handling of the reception. If it's ok with you, I will send the checks directly to you for dispersal. I will need 3 rooms at Super 8 motel for the seminar. I'll be staying only 1 night but 2 staff members will be staying for the entire seminar. Please check with Dick Manatt before placing the reservations, he has contacted us about this in the past. If you have any questions or need further assistance please feel free in contacting myself or my assistant Tammy Fulton (612)829-3095.

Sincerely,

Richard Dyches
Director of Test and Measurement
## ISU Extended Education

**Summer Semester 1994, Budget Planning Form**

for Face-to-Face, Telenet, Videotape Courses

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<th>Location</th>
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### COURSE EXPENSES

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<td>ISU fringe benefits for an instructor appointed to teach only this course (23.1%)</td>
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<td>(ISU Van to transport out-of-town participants from Story City to Gilbert and back each day)</td>
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<tr>
<td>Course materials: postage and UPS charges, copy center, exam scoring, film rental, etc. ($15/credit minimum)</td>
<td>$30</td>
</tr>
<tr>
<td>Marketing: Off-campus catalog and press releases ($250)</td>
<td>$250</td>
</tr>
<tr>
<td>Newspaper advertising, mailing large volume of fliers, etc.</td>
<td></td>
</tr>
<tr>
<td>Room rental (Schaman $50/day)</td>
<td></td>
</tr>
<tr>
<td>Telenet line charges ($45/clock hour)</td>
<td></td>
</tr>
<tr>
<td>Engineering Annex videotape classroom studio</td>
<td></td>
</tr>
<tr>
<td>Equipment and supplies ($100/credit x ____ credits)</td>
<td></td>
</tr>
<tr>
<td>Camera operators ($175/credit x ____ credits)</td>
<td></td>
</tr>
<tr>
<td>Tape duplication</td>
<td></td>
</tr>
<tr>
<td>Other (specify) $200 for DOS computer set-up (Gilbert has only low RAM MAC)</td>
<td>$400</td>
</tr>
<tr>
<td>$200 for am and pm refreshments for 25 at $1.00 per person</td>
<td>$2696</td>
</tr>
<tr>
<td>TOTAL COSTS</td>
<td></td>
</tr>
</tbody>
</table>

over, please
Summer Semester 1994, Budget Planning Form
for Face-to-Face, Telenet, Videotape Courses

Course Number Ed Ad 615 Credit Hours 2

******************************************************************************

FIGURING THIS COURSE'S "GO" NUMBER:

Total direct costs (from other side) $2696
Indirect costs (20% of above total) $540

TOTAL EXPENSES $3236

Course tuition per student = $304
($96 per undergraduate credit,
or $152 per graduate credit)*

*submitted, but not yet approved by Board of Regents

Minimum number of students needed to break even,
i.e., "GO" number (divide Total Expenses
by Course Tuition Per Student)

11

All courses offered in western Iowa need a minimum of 8 students to "GO".

Is this a contract or grant course? Yes X No __

If yes, sponsor name National Computer System/Gilbert Community School District

**Is this an achievable enrollment for this offering?
If not, contact Extended Education to discuss options.

******************************************************************************

College Coordinator ___________________________ Date 3/15/94

Extended Education ___________________________ Date 3/24/94
# School Improvement Model

**Group or School:** Educational Administration (ED ADM) 615  
**Date(s):** June 8 - 11, 1994  
**Attending:** Teachers (Basehor-Linwood, Gilbert, and Valparaiso School Districts)  
**Location:** Gilbert High School Library School Districts (Iowa State University)

<table>
<thead>
<tr>
<th>TIME</th>
<th>TOPIC</th>
<th>PRESENTER</th>
<th>MODE</th>
<th>VISUALS</th>
<th>HANDOUTS</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td><strong>DAY ONE:</strong></td>
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<tr>
<td>8:00 a.m.</td>
<td>* Introductions</td>
<td></td>
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<tr>
<td>8:10 a.m.</td>
<td>* Keynote: &quot;Achieving Educational Goals Through Classroom Integration of Curriculum, Instruction, and Assessment&quot;</td>
<td>Manatt</td>
<td>LGD</td>
<td>Overhead</td>
<td>Press Release</td>
<td>CRM-68, CRM-59</td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>* A Board Member's Point of View</td>
<td>Rice</td>
<td>LGD</td>
<td>Overhead</td>
<td>Flow Chart</td>
<td></td>
</tr>
<tr>
<td>9:15 a.m.</td>
<td>* A Teacher's Point of View</td>
<td>Korf</td>
<td>LGD</td>
<td>Overhead</td>
<td>Notebook</td>
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</tr>
<tr>
<td>10:00 a.m.</td>
<td>* Question-and-Answer</td>
<td>Manatt</td>
<td>LGD</td>
<td>Overhead</td>
<td>Manatt/Holzman</td>
<td>CRM-2</td>
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<tr>
<td>12:00 p.m.</td>
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</tr>
<tr>
<td>1:30 p.m.</td>
<td>* The Curriculum Development Framework</td>
<td>Stow/</td>
<td>LGD/</td>
<td>Overhead</td>
<td>Notebook</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Philosophy</td>
<td>District</td>
<td>SGD</td>
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<tr>
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<td>- Strands</td>
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<tr>
<td></td>
<td>- Program Goals</td>
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<tr>
<td>4:00 p.m.</td>
<td>DISMISSAL</td>
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<td>Homework Assignment: &quot;Systems Approach to Criterion-Referenced Testing&quot; CRM-5</td>
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<tr>
<td><strong>DAY TWO:</strong></td>
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<tr>
<td>8:00 a.m.</td>
<td>* Review/Preview</td>
<td>Manatt</td>
<td>LGD</td>
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<td></td>
<td>* Curriculum Planning with National Standards</td>
<td>Manatt</td>
<td>LGD</td>
<td>Overhead</td>
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<td>NEW GOALS 2000</td>
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<tr>
<td></td>
<td>* The Curriculum Development Framework</td>
<td>Stow/</td>
<td>LGD/</td>
<td>Overhead</td>
<td>Notebook</td>
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<td>- Scope and Sequence</td>
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<td>* Using the Curriculum Bridge</td>
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<td>Notebook</td>
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<td>1:30 p.m.</td>
<td>* Writing Learner Outcomes</td>
<td>Stow/</td>
<td>LGD</td>
<td>Overhead</td>
<td>Selected Learner</td>
<td>SIM typist on duty</td>
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<td></td>
<td>District Committees</td>
<td>District</td>
<td></td>
<td></td>
<td>Outcomes</td>
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<tr>
<td>3:00 p.m.</td>
<td>* Assessment for the Class, the Building, the</td>
<td>Putz</td>
<td>LGD</td>
<td>Overhead</td>
<td>Notebook</td>
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<td>4:00 p.m.</td>
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<tr>
<td><strong>DAY THREE:</strong></td>
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<tr>
<td>8:00 a.m.</td>
<td>* Review/Preview</td>
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<td>LGD</td>
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<td>8:10 a.m.</td>
<td>* Writing Criterion-Referenced Measures</td>
<td>Stow/</td>
<td>LGD</td>
<td>Overhead</td>
<td>Sample Test Items</td>
<td>SIM typist on duty</td>
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<td>District Committees</td>
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</tr>
</tbody>
</table>
### Workshop Planner

**School Improvement Model**

**Director:** Richard P. Manatt, Ph.D.
**Co-Director:** Shirley B. Stow, Ph.D.
(Iowa State University)

<table>
<thead>
<tr>
<th>TIME</th>
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<td>1:30 p.m.</td>
<td>* Using the Computer Platform</td>
<td>Ashby</td>
<td>LGD</td>
<td>NCS Platform</td>
<td>Printouts</td>
<td>Score a Test/Make Reports</td>
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<tr>
<td>2:30 p.m.</td>
<td>* Committee Assignments</td>
<td>Manatt</td>
<td>IS</td>
<td>Overhead</td>
<td>Test Item Forms</td>
<td>SIM typist on duty</td>
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<td>4:00 p.m.</td>
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**Day Four:**

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<th>REMARKS</th>
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<tbody>
<tr>
<td>8:00 a.m.</td>
<td>* Review/Preview</td>
<td>Manatt</td>
<td>LGD</td>
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<td>8:10 a.m.</td>
<td>* Ethical Issues of High Stakes Testing</td>
<td>Manatt</td>
<td>LGD</td>
<td>Overhead</td>
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<td>Test Preparation Practices CRM-41, CRM-53</td>
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<tr>
<td>9:30 a.m.</td>
<td>* Committee Assignments/Exchange of Test Items</td>
<td>Manatt/Stow</td>
<td>SGD</td>
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<td></td>
<td>Test Booklet SIM typist on duty Pages CRM-35, CRM-31</td>
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<td>12:00 p.m.</td>
<td>LUNCH</td>
<td>OYO</td>
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<td>1:30 p.m.</td>
<td>* Pilot Testing and Scoring</td>
<td>Manatt</td>
<td>LGD</td>
<td>Overhead</td>
<td></td>
<td>Critiquing CRM's CRM-35, CRM-31</td>
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<tr>
<td>2:30 p.m.</td>
<td>* Next Steps</td>
<td>Manatt</td>
<td>LGD</td>
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<td>Fall Assignment</td>
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<td>3:00 p.m.</td>
<td>DISMISSAL</td>
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APPENDIX C.

MATHEMATICS CURRICULUM
<table>
<thead>
<tr>
<th>GR-ST-PG-TX-TL</th>
<th>DESCRIPTION</th>
<th>PARTIAL MASTERY %</th>
<th>MASTERY %</th>
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<tbody>
<tr>
<td>05</td>
<td>Fifth Grade</td>
<td>65</td>
<td>40</td>
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<tr>
<td>05-01</td>
<td>Unit 1: Place value, addition, and subtraction.</td>
<td></td>
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<tr>
<td>05-01-01</td>
<td>The student will be able to understand place value through hundred thousands.</td>
<td></td>
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<tr>
<td>05-01-01-CO</td>
<td>Comprehension</td>
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<td></td>
</tr>
<tr>
<td>05-01-01-CO-01</td>
<td>The student will identify and explain the place value for any digit in a number through billions.</td>
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<td></td>
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<tr>
<td>05-01-03</td>
<td>The student will be able to round to thousands.</td>
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<tr>
<td>05-01-03-AP</td>
<td>Application</td>
<td></td>
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</tr>
<tr>
<td>05-01-03-AP-02</td>
<td>The student will demonstrate rounding numbers to the nearest tenths, hundredths, and thousandths.</td>
<td></td>
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</tr>
<tr>
<td>05-01-05</td>
<td>The student will be able to use addition properties.</td>
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<tr>
<td>05-01-05-AP</td>
<td>Application</td>
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<tr>
<td>05-01-05-AP-03</td>
<td>The student will compute using addition and subtraction properties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-01-06</td>
<td>The student will be able to add and subtract with renaming 4-digit numbers.</td>
<td></td>
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<tr>
<td>05-01-06-AN</td>
<td>Analysis</td>
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<tr>
<td>05-01-06-AN-04</td>
<td>The student will estimate the sum of two numbers, up to four digits, without renaming.</td>
<td></td>
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<tr>
<td>05-01-06-AN-05</td>
<td>The student will estimate the differences of two numbers, up to four digits, with no renaming.</td>
<td></td>
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<tr>
<td>05-01-06-AP</td>
<td>Application</td>
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<tr>
<td>05-01-06-AP-07</td>
<td>The student will compute using addition or subtraction of money.</td>
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<tr>
<td>05-01-06-EV</td>
<td>Evaluation</td>
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<tr>
<td>05-01-06-EV-06</td>
<td>The student will solve problems by writing equations</td>
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</tr>
<tr>
<td>Description</td>
<td>MASTERY %</td>
<td>PARTIAL MASTERY %</td>
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<tr>
<td>----------------------------------------------------------------------------</td>
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<tr>
<td><em>(continued)</em> involving addition and subtraction.</td>
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<tr>
<td><strong>05-02</strong> Unit 2: Multiplication</td>
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<tr>
<td><strong>05-02-07</strong> The student will be able to multiply 3-digit numbers with</td>
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<tr>
<td>renaming.</td>
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<tr>
<td><strong>05-02-07-AN-06</strong> The student will estimate the product of a two-digit</td>
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<tr>
<td>number by a two-digit number.</td>
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<td><strong>05-02-07-AP</strong> Application</td>
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<tr>
<td><strong>05-02-07-AP-02</strong> The student will compute by multiplying a two, three, or</td>
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<td>four-digit number by a one-digit number.</td>
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<td><strong>05-02-07-AP-03</strong> The student will compute by multiplying three one-digit</td>
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<tr>
<td>numbers.</td>
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<td><strong>05-02-07-AP-04</strong> The student will compute by multiplying a two or three-digit</td>
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<td>number by a three-digit number.</td>
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<td><strong>05-02-07-CO</strong> Comprehension</td>
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<tr>
<td><strong>05-02-07-CO-01</strong> The student will write products for multiplication</td>
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<td>facts and write multiples of a number.</td>
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<td><strong>05-02-07-EV</strong> Evaluation</td>
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<td><strong>05-02-07-EV-05</strong> The student will solve problems by choosing addition,</td>
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<td>subtraction, or multiplication.</td>
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<td><strong>05-03</strong> Unit 3: Division with one-digit divisors.</td>
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<td><strong>05-03-08</strong> The student will be able to divide 2-digit numbers</td>
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<td>not ending in zero.</td>
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<td><strong>05-03-08-AN</strong> Analysis</td>
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<tr>
<td><strong>05-03-08-AN-06</strong> The student will solve problems by choosing equations</td>
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<tr>
<td>involving addition, subtraction, multiplication, or division.</td>
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<tr>
<td><strong>05-03-08-AN-07</strong> The student will find averages by using addition and</td>
<td></td>
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</table>
The student will use equations to solve word problems involving addition, subtraction, multiplication, and division.

The student will compute by dividing a one-digit divisor to get a two-digit quotient with or without remainders.

The student will compute by dividing a one-digit divisor to get a three-digit quotient without remainders.

The student will compute by dividing a one-digit divisor to get a three-digit quotient with remainders.

The student will compute by dividing a one-digit divisor to get a quotient with one or two zeros with or without remainders.

The student will divide an amount of money by a whole number.

The student will write quotients for division facts.

The student will be able to divide 2-digit numbers not ending in zero.

The student will round the divisor to make a better estimate for the quotient.

The student will solve problems by choosing addition, subtraction, multiplication, or division.

The student will solve problems by interpreting remainders.
### CURRICULUM LISTING

**ELEMENTARY MATHEMATICS**

**DIMENSION:** GR-ST-PG-TX-TL  
**SUBTOTAL INDICATORS:** N N N N Y  
**MASTERY BASIS:** C C C C I  
**MASTERY FLAG:** MASTERY  
**SUBJECT ABBR:** MA  
**DEFAULT MASTERY %:** 80  
**DEFAULT PARTIAL MASTERY %:** 50

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<th>Code</th>
<th>Description</th>
<th>MASTERY %</th>
<th>MASTERY %</th>
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</thead>
</table>
| 05-04-08-AP | Application  
The student will compute by dividing a two-digit divisor to get a one-digit quotient. |           |           |
| 05-04-08-AP-01 | The student will use division to find the missing factor. |           |           |
| 05-04-08-AP-02 | The student will compute by dividing a two-digit divisor to get a two-digit quotient. |           |           |
| 05-04-08-AP-04 | The student will compute by dividing a two-digit divisor to get a three-digit quotient. |           |           |
| 05-04-08-AP-05 | The student will correct estimates in two-digit quotients. |           |           |
| 05-04-08-AP-06 | The student will compute by dividing a two-digit divisor to get a quotient with one or two zeros. |           |           |
| 05-04-08-AP-07 | The student will understand meaning of decimals through hundredths. |           |           |
| 05-05 | Unit 5: Addition and subtraction of decimals.  
**05-05-12** | The student will be able to add or subtract decimals through hundredths. |           |           |
| 05-05-13-AP | Application  
The student will add two or more decimals through thousandths. |           |           |
| 05-05-13-AP-04 | The student will subtract decimals through thousandths. |           |           |
| 05-06 | Unit 6: Multiplication of decimals.  
**05-06-17** | The student will be able to solve problems by choosing |           |           |
<table>
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<th>Date</th>
<th>Description</th>
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<td>Continued operations.</td>
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<td>05-06-17-AN</td>
<td>Analysis</td>
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<tr>
<td>05-06-17-AN-05</td>
<td>The student will solve problems by choosing addition, subtraction, or multiplication of decimals.</td>
</tr>
<tr>
<td>05-06-18</td>
<td>The student will be able to count decimal places through hundred-thousandths.</td>
</tr>
<tr>
<td>05-06-18-AN</td>
<td>Analysis</td>
</tr>
<tr>
<td>05-06-18-AN-01</td>
<td>The student will count decimal places through hundred-thousandths.</td>
</tr>
<tr>
<td>05-06-19</td>
<td>The student will be able to multiply decimals by whole numbers or decimals.</td>
</tr>
<tr>
<td>05-06-19-AN</td>
<td>Analysis</td>
</tr>
<tr>
<td>05-06-19-AN-02</td>
<td>The student will multiply a decimal by a whole number.</td>
</tr>
<tr>
<td>05-06-19-AN-03</td>
<td>The student will multiply by a whole number or a decimal by a decimal.</td>
</tr>
<tr>
<td>05-06-19-AN-04</td>
<td>The student will multiply decimals involving zeros in a product.</td>
</tr>
<tr>
<td>05-07</td>
<td>Unit 7: Measurement</td>
</tr>
<tr>
<td>05-07-06</td>
<td>The student will be able to add and subtract with renaming 4-digit numbers.</td>
</tr>
<tr>
<td>05-07-AP</td>
<td>Application</td>
</tr>
<tr>
<td>05-07-AP-05</td>
<td>The student will add or subtract measurements with renaming.</td>
</tr>
<tr>
<td>05-07-14</td>
<td>The student will be able to find the perimeter and area.</td>
</tr>
<tr>
<td>05-07-AP</td>
<td>Application</td>
</tr>
<tr>
<td>05-07-14-AP-02</td>
<td>The student will find perimeter, area, and volume.</td>
</tr>
<tr>
<td>05-07-20</td>
<td>The student will be able to measure objects using metric</td>
</tr>
</tbody>
</table>
05-07-20 (continued) and standard measures.

05-07-20-AP Application

05-07-20-AP-01 The student will measure objects to the nearest centimeter and choose the appropriate measure of length using millimeter, centimeter, meter, decimeter, or kilometer.

05-07-20-AP-03 The student will measure objects to the nearest inch, foot, yard, or mile.

05-07-21 The student will be able to understand Fahrenheit and Celsius measure.

05-07-21-AP Application

05-07-21-AP-04 The student will read a thermometer and choose an appropriate temperature using Celsius and Fahrenheit.

05-08 Unit 8: Meaning of fractions.

05-08-09 The student will be able to understand vocabulary of fractions.

05-08-09-AP Application

05-08-09-AP-01 The student will write a fraction for part of a whole or a set.

05-08-09-AP-02 The student will find missing numerators or denominators by multiplying or dividing.

05-08-09-AP-09 The student will identify equal fractions for pictured situations.

05-08-12 The student will be able to understand meaning of decimals through hundredths.

05-08-12-AP Application

05-08-12-AP-08 The student will write decimals for fractions or mixed numbers for decimals.

05-08-22 The student will be able to identify fractions as lowest
## Elementary Mathematics

### 05-08-22

**Analysis**

05-08-22-AN

The student will write fractions in lowest terms.

05-08-22-AN-03

The student will compare fractions and mixed numbers with same and different denominators.

05-08-22-AN-04

The student will find the lowest common denominator for two or three fractions.

05-08-22-AN-05

The student will solve problems by interpreting the remainder.

05-08-22-AN-10

The student will identify mixed numbers to give the length of objects.

05-08-22-AN-11

**Application**

05-08-22-AP

The student will divide whole numbers and give an answer as a mixed number.

05-08-22-AP-06

The student will write mixed numbers for improper fractions or improper fractions for mixed numbers.

05-08-22-AP-07

**Unit 9: Multiplication of fractions.**

05-09

The student will be able to compute multiplication of fractions.

05-09-23

**Analysis**

05-09-23-AN

**Application**

05-09-23-AP

The student will find the product of two or three fractions.

05-09-23-AP-01

The student will multiply a fraction and a whole number.

05-09-23-AP-02

The student will multiply with mixed numbers.

05-09-23-AP-04

The student will be able to calculate probability using given information.

05-09-24

**Analysis**

05-09-24-AN
<table>
<thead>
<tr>
<th>GR-ST-PG-TX-TL</th>
<th>DESCRIPTION</th>
<th>PARTIAL MASTERY %</th>
<th>MASTERY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>05-09-24-AN-03</td>
<td>The student will interpret and record data to show the results of probability experiments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-09-24-AN-05</td>
<td>The student will use multiplication to predict results of probability experiments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10</td>
<td>Unit 10: Addition and subtraction of fractions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-10</td>
<td>The student will be able to add with uncommon denominators.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-10-AP</td>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-10-AP-01</td>
<td>The student will add two fractions with the same denominator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-10-AP-02</td>
<td>The student will add two mixed numbers with the same denominator and rename the sum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-10-AP-03</td>
<td>The student will add two or three mixed numbers with different denominators.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-11</td>
<td>The student will be able to subtract with unlike denominators.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-11-AP</td>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-11-AP-04</td>
<td>The student will subtract mixed numbers with different denominators using renaming.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-17</td>
<td>The student will be able to solve problems by choosing operations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-17-AP</td>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-10-17-AP-05</td>
<td>The student will solve word problems by choosing addition, subtraction, or multiplication of fractions and mixed numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11</td>
<td>Unit 11: Geometry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-14</td>
<td>The student will be able to find perimeter and area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-14-KN</td>
<td>Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-14-KN-08</td>
<td>The student will find areas of rectangles and triangles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15</td>
<td>The student will be able to identify and measure angles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-AN</td>
<td>Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-AN-01</td>
<td>The student will identify points, lines, segments, rays intersecting lines, and parallel lines.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-AN-02</td>
<td>The student will identify right angles, acute angles, and obtuse angles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-AN-03</td>
<td>The student will give measures of angles by using a protractor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-AN-05</td>
<td>The student will draw congruent angles and perpendicular lines using a protractor.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-KN</td>
<td>Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-15-KN-07</td>
<td>The student will find lines of symmetry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-25</td>
<td>The student will be able to understand geometric terms and concepts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-25-KN</td>
<td>Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-25-KN-05</td>
<td>The student will identify the center, radius, diameter, and the central angles of a circle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05-11-25-KN-06</td>
<td>The student will identify triangles, parallelograms, rectangles, squares, pentagons, hexagons, and octagons, and find their lengths.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Curriculum Statements Printed:** 153
### Sixth Grade

**Unit 1: Addition and Subtraction of Whole Numbers**

**Analysis**

06-01-01

The student will be able to read, compare, and order whole numbers with place values to billions and decimals with place values to ten-thousandths.

06-01-01-AN

The student will compare and order whole numbers.

06-01-02

The student will be able to identify names of place values and periods from billions to ten-thousandths.

06-01-02-CO

Comprehension

06-01-02-CO-01

The student will write numbers and give the place value for any digit in a number through trillionths.

06-01-04

The student will be able to add whole numbers up to three 5-digit addends involving renaming.

06-01-04-AP

Application

06-01-04-AP-05

The student will add two or three numbers with up to six digits, with more than one renaming.

06-01-05

The student will be able to subtract whole numbers up to a 5-digit subtrahend and a 5-digit minuend involving renaming.

06-01-05-AN

Analysis

06-01-05-AN-09

The student will find missing addends in simple equations.

06-01-05-AP

Application

06-01-05-AP-06

The student will subtract two or three numbers with up to six digits, with more than one renaming.

06-01-16

The student will be able to estimate sums and differences of whole numbers to the nearest one thousand, ten thousand, and hundred thousand.

06-01-16-AN

Analysis
GR-ST-PG-TX-TL DESCRIPTION

06-01-16-AN-04 The student will estimate sums and differences using rounded numbers.

06-01-16-AP Application

06-01-16-AP-03 The student will round numbers to the nearest hundred, thousand, or ten-thousand.

06-01-25 The student will be able to solve single-step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.

06-01-25-EV Evaluation

06-01-25-EV-07 The student will solve word problems by choosing addition or subtraction.

06-01-25-EV-10 The student will solve problems by writing equations involving addition or subtraction.

06-01-26 The student will be able to collect data and organize into charts, tables, line graphs, and bar graphs.

06-01-26-SY Synthesis

06-01-26-SY-08 The student will design models and create tables using logical reasoning to solve word problems.

06-01-33 The student will be able to define and give examples of the following properties: commutative property of multiplication and addition, associative property of multiplication and addition, distributive property of multiplication, multiplicative property of one and zero.

06-01-33-AP Application

06-01-33-AP-11 The student will define and use the commutative and associative properties of addition.

06-02 Unit 2: Multiplication of Whole Numbers

06-02-06 The student will be able to multiply whole numbers up to a 3-digit factor times a 2-digit factor.

06-02-06-AN Analysis
PERFORMANCE PLUS
CURRICULUM LISTING
ELEMENTARY MATHEMATICS

DIMENSION: GR-ST-PG-TX-TL
SUBTOTAL INDICATORS: N N N N Y
MASTERY BASIS: C C C C I

305

SUBJECT ABBR: MA
MASTERY FLAG: MASTERY
DEFAULT MASTERY %: 80
DEFAULT PARTIAL MASTERY %: 50

GR-ST-PG-TX-TL | DESCRIPTION | PARTIAL MA | PARTIAL MASTERY % | MASTERY % | MASTERY %
--- | --- | --- | --- | --- | ---
06-02-06-AN-09 | The student will write multiples of numbers to find the LCM of two numbers. | | | | |
06-02-06-AN-10 | The student will solve problems by finding patterns using diagrams. | | | | |
06-02-06-AP | Application | | | | |
06-02-06-AP-02 | The student will multiply numbers that are multiples of 10, 100, or 1000. | | | | |
06-02-06-AP-04 | The student will multiply two numbers with each factor containing three digits. | | | | |
06-02-06-CO | Comprehension | | | | |
06-02-06-CO-01 | The student will write products for multiplication facts and write pairs of related multiplication facts. | | | | |
06-02-06-CO-08 | The student will use exponents to write products and write numbers with exponents in standard form. | | | | |
06-02-17 | The student will be able to estimate the product of whole numbers to the nearest one thousand, ten thousand, and hundred thousand. | | | | |
06-02-17-AN | Analysis | | | | |
06-02-17-AN-03 | The student will estimate the product of two or three numbers by rounding and then multiplying. | | | | |
06-02-25 | The student will be able to solve single-step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division. | | | | |
06-02-25-BV | Evaluation | | | | |
06-02-25-BV-05 | The student will solve problems by choosing addition, subtraction, or multiplication. | | | | |
06-02-25-BV-06 | The student will use logical reasoning, trial and error, and discover patterns to solve problems. | | | | |
06-02-27 | The student will be able to read the following visual aids | | | | |
06-02-27 (continued)
in order to draw conclusions, make comparisons, and make inferences: chart, table, bar graph, line graph.

06-02-27-EV
Evaluation
The student will use diagrams to solve problems.

06-02-33
The student will be able to define and give examples of the following properties: commutative property of multiplication and addition, associative property of multiplication and addition, distributive property of multiplication, multiplicative property of one and zero.

06-02-33-AP
Application
The student will define and use the property of zero, property of one, commutative, and associative properties of multiplication.

06-03
Unit 3: Division of Whole Numbers
The student will be able to divide whole numbers up to a 5-digit dividend and a 2-digit divisor involving remainders.

06-03-07-AN
Analysis
The student will round dividends and divisors to estimate quotients.
The student will find missing factors in simple equations.
The student will write the factors of a number and find the GCF of two factors.
The student will tell whether a number is prime or composite.

06-03-07-AP
Application
The student will divide by a one-digit divisor to get up to a four-digit quotient including remainders.
The student will divide by a two-digit divisor to get up to a four-digit quotient including remainders.
The student will be able to solve single-step and multi-
step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.

Evaluation
The student will solve word problems by interpreting remainders.

The student will solve word problems by choosing addition, subtraction, multiplication, or division.

Synthesis
The student will solve problems by writing equations.

The student will be able to read the following visual aids in order to draw conclusions, make comparisons, and make inferences: chart, table, bar graph, line graph.

Evaluation
The student will use models, trial and error, lists, and tables to solve problems.

The student will be able to calculate the mean, median, and mode of a given example of data.

Analysis
The student will find the mean, median, and mode of a given set of numbers.

Unit 4: Addition and Subtraction of Decimals
The student will be able to read, compare, and order whole numbers with place values to billions and decimals with place values to ten-thousandths.

Analysis
The student will compare and order decimals through thousandths.

The student will be able to identify names of place values
GR-ST-PG-TX-TL  DESCRIPTION

06-04-02  (continued) and periods from billions to ten-thousandths.

06-04-02-CO  Comprehension

06-04-02-CO-01  The student will write decimals in words as well as standard forms through thousandths.

06-04-03  The student will be able to determine the total value of digits in place values from one billion to ten-thousandths.

06-04-03-CO  Comprehension

06-04-03-CO-02  The student will give the place value for any digit in a decimal through millionths.

06-04-08  The student will be able to add decimals up to three 5-digit addends involving renaming.

06-04-08-AP  Application

06-04-08-AP-06  The student will add or subtract two or more decimals with place values through thousandths.

06-04-18  The student will be able to estimate the sum and difference of decimals to the nearest ten, unit, tenth, and hundredth.

06-04-18-AN  Analysis

06-04-18-AN-04  The student will round decimals to the nearest one, tenth, hundredth, or thousandth.

06-04-18-AN-05  The student will estimate the sum or difference of two decimals to the nearest tenth.

06-04-25  The student will be able to solve single-step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication and division.

06-04-25-BV  Evaluation

06-04-25-BV-08  The student will solve problems using trial and error, logical reasoning, and physical models.

06-04-26  The student will be able to collect data and organize data
Curriculum Listing
Elementary Mathematics
309

Description

Evaluation

The student will solve problems using trial and error, logical reasoning, and physical models.

Unit 5: Multiplication and Division of Decimals

The student will be able to multiply decimals up to a 3-digit factor times a 2-digit factor involving renaming.

Application

The student will multiply a whole number or a decimal by a decimal.

The student will multiply decimals involving zeros in the product.

The student will multiply a decimal by 10, 100, and 1000.

The student will be able to divide decimals up to a 5-digit decimal dividend and a 2-digit decimal divisor.

Analysis

The student will round the quotient of two decimals to the nearest ones, tenths, and hundredths.

Application

The student will divide a decimal by a whole number.

The student will divide a decimal by a whole number to obtain a quotient involving zeros.

The student will divide a decimal by a decimal.

The student will divide a decimal by a decimal when it is necessary to add zeros to the dividend.

The student will be able to estimate the product of two decimals to the nearest hundred, ten, unit, tenth, and
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Mastery %</th>
<th>Partial Mastery %</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-05-19</td>
<td>(continued) hundredth.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-19-AN</td>
<td>Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-19-AN-12</td>
<td>The student will estimate the product of two decimals to the nearest 10, unit, tenth, and hundredths.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-24</td>
<td>The student will be able to memorize the values of metric prefixes and will convert units of measure up to kilo to milli or vice-versa (using multiplication and division).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-24-AP</td>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-24-AP-10</td>
<td>The student will divide a decimal by 10, 100, and 1000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-25</td>
<td>The student will be able to solve single step and multi-step word problems involving whole numbers, decimals, fractions using addition, subtraction, multiplication, and division.</td>
<td></td>
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<tr>
<td>06-05-25-EV</td>
<td>Evaluation</td>
<td></td>
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</tr>
<tr>
<td>06-05-25-EV-06</td>
<td>The student will solve multi-step word problems involving decimals using the four basic mathematical operations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-26</td>
<td>The student will be able to collect data and organize data into charts, tables, line graphs, and bar graphs.</td>
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</tr>
<tr>
<td>06-05-26-EV</td>
<td>Evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-05-26-EV-11</td>
<td>The student will use physical models, figures, and draw diagrams and pictures to solve word problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-06 Unit 6: Measurement</td>
<td></td>
<td></td>
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<tr>
<td>06-06-07</td>
<td>The learner will be able to divide whole numbers up to a 5-digit dividend and a 2-digit divisor involving renaming.</td>
<td></td>
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<tr>
<td>06-06-07-AP</td>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-06-07-AP-02</td>
<td>The student will add or subtract customary measures with renaming.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>06-06-16</td>
<td>The student will be able to estimate sums and differences of</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(continued)

06-06-16

whole numbers to the nearest one thousand, ten thousand, and hundred thousand.

06-06-16-AN

Analysis

06-06-16-AN-04

The student will estimate temperatures of various environments using Fahrenheit and Celsius scales.

06-06-20

The student will be able to measure the length of an object to the nearest meter, centimeter, millimeter, yard, foot, inch, 1/2 inch, 1/4 inch, 1/8 inch, and 1/16 of an inch.

06-06-20-AN

Analysis

06-06-20-AN-01

The student will estimate the length of an object using inches, feet, yards, or miles and find an equal measure for a given customary measure of length.

06-06-20-AN-06

The student will measure the length of an object to the nearest inch, 1/2 inch, 1/4 inch, 1/8 inch, and 1/16 inch of an inch and draw a segment for a given measure.

06-06-23

The student will be able to measure the amount of liquid in a container to the nearest milli-liter.

06-06-23-AN

Analysis

06-06-23-AN-05

The student will, when given a standard measure of liquid capacity or weight, convert to an equal amount in cups, pints, quarts, gallons, or ounces, pounds, and tons.

06-06-24

The student will be able to memorize the values of metric prefixes and will convert units of measure up to kilo to milli or visa-versa (using multiplication and division.)

06-06-24-AN

Analysis

06-06-24-AN-01

The student will find an equal measure for a given metric measure of length, capacity, or mass.

06-06-27

The student will be able to read the following visual aids in order to draw conclusions, make comparisons, and make inferences: chart, table, bar graph, line graph.

06-06-27-AN

Analysis
| GR-ST-PG-TX-TL | DESCRIPTION | PARTIAL
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>06-06-27-AN-03</td>
<td>The student will read the scale on a Fahrenheit and Celsius thermometer.</td>
<td></td>
</tr>
<tr>
<td>06-07</td>
<td>Unit 7: Meaning of Fractions</td>
<td></td>
</tr>
<tr>
<td>06-07-02</td>
<td>The student will be able to identify names of fractions, compare fractions, use mixed numbers, and calculate conversions with decimals and fractions.</td>
<td></td>
</tr>
<tr>
<td>06-07-02-CO</td>
<td>Comprehension</td>
<td></td>
</tr>
<tr>
<td>06-07-02-CO-01</td>
<td>The student will write a fraction for part of a whole or part of a set.</td>
<td></td>
</tr>
<tr>
<td>06-07-07</td>
<td>The student will be able to divide whole numbers up to a 5-digit divisor involving renaming.</td>
<td></td>
</tr>
<tr>
<td>06-07-07-AP</td>
<td>Application</td>
<td></td>
</tr>
<tr>
<td>06-07-07-AP-07</td>
<td>The student will divide whole numbers and give the quotient as a fraction or a mixed number.</td>
<td></td>
</tr>
<tr>
<td>06-07-11</td>
<td>The student will be able to divide decimals up to a 5-digit decimal dividend and a 2-digit involving remainders.</td>
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<tr>
<td>06-07-11-AP</td>
<td>Application</td>
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</tr>
<tr>
<td>06-07-11-AP-11</td>
<td>The student will write a decimal for a fraction, and vice versa.</td>
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<tr>
<td>06-07-11-AP-12</td>
<td>The student will write decimals in specific form.</td>
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<tr>
<td>06-07-12</td>
<td>The student will be able to add mixed numbers with unlike single digit denominators.</td>
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<tr>
<td>06-07-12-AN</td>
<td>Analysis</td>
<td></td>
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<tr>
<td>06-07-12-AN-03</td>
<td>The student will write fractions in lowest terms.</td>
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<tr>
<td>06-07-12-AN-04</td>
<td>The student will select a LCM for two fractions and write the fractions with the LCM</td>
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<tr>
<td>06-07-12-AP</td>
<td>Application</td>
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<tr>
<td>06-07-12-AP-02</td>
<td>The student will write a fraction for part of a whole or</td>
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<td>06-07-14</td>
<td>The student will be able to multiply mixed numbers with denominators up to 20.</td>
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<tr>
<td>06-07-14-AP-09</td>
<td>The student will write an improper fraction for a whole number or mixed number, and vice versa.</td>
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<td>06-07-25</td>
<td>The student will be able to solve single step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.</td>
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<tr>
<td>06-07-25-AN</td>
<td>Analysis</td>
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<tr>
<td>06-07-25-AN-05</td>
<td>The student will compare and order fractions.</td>
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<td>06-07-25-EV</td>
<td>Evaluation</td>
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<td>06-07-25-EV-08</td>
<td>The student will solve problems and interpret the remainders as fractions.</td>
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<tr>
<td>06-07-27</td>
<td>The student will be able to read the following visual aids in order to draw conclusions, make comparisons, and make inferences: chart, table, bar graphs, line graph.</td>
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<td>06-07-27-AN</td>
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<tr>
<td>06-07-27-AN-06</td>
<td>The student will write a mixed number for a pictured situation and compare mixed numbers.</td>
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<td>06-07-27-SY</td>
<td>Synthesis</td>
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<td>06-07-27-SY-10</td>
<td>The student will use models, find patterns, list all possibilities, and make tables to solve problems.</td>
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<td>06-08</td>
<td>Unit 8: Multiplication and Division of Fractions</td>
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<td>The student will be able to multiply mixed numbers with denominators up to 20.</td>
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<td>06-08-14-AN</td>
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The student will cancel to multiply fractions, whole numbers and mixed numbers.

The student will multiply two fractions.

The student will multiply a fraction and a whole number.

The student will multiply and divide fractions, whole numbers, and mixed numbers.

The student will use fractions to predict outcomes of events.

The student will be able to divide mixed numbers with denominators.

The student will use pictures to divide two fractions and will also find the reciprocal of a fraction.

The student will be able to solve single-step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.

The student will solve word problems involving too much or too little information.

The student will write probabilities as fractions.

The student will use models, logical reasoning, patterns, and list all possibilities to solve problems.

The student will write a word problem for a given situation.

Unit 9: Addition and Subtraction of Fractions

The student will be able to add mixed numbers with unlike
6-09-12

(continued)
single digit denominators.

6-09-12-AP

Application

The student will add two or more fractions and mixed numbers with the same denominator.

6-09-12-AP-02

The student will add fractions and mixed numbers with different denominators.

6-09-13

The student will be able to subtract mixed numbers with unlike single digit denominators.

6-09-13-AP

Application

6-09-13-AP-03

The student will subtract fractions and mixed numbers with same/different denominators involving renaming.

6-09-25

The student will be able to solve single step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.

6-09-25-AN

Analysis

6-09-25-AN-05

The student will choose from the four basic mathematical operations to solve word problems.

6-09-25-SY

Synthesis

6-09-25-SY-06

The student will work backwards and write equations to solve problems.

6-09-26

The student will be able to collect data and organize into charts, tables, line graphs, and bar graphs.

6-09-26-SY

Synthesis

6-09-26-SY-04

The student will draw diagrams, use trial and error, and models to solve problems.

6-10

Unit 10: Geometry

6-10-21

The student will be able to memorize the formula and
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<tr>
<td>06-10-21</td>
<td>(continued) calculate the area of the following polygon: square, rectangle, triangle, and parallelogram.</td>
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<td>06-10-21-AN</td>
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<td>06-10-21-AN-09</td>
<td>The student will estimate perimeter and area to solve problems.</td>
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<td>06-10-25</td>
<td>The student will be able to solve single step and multi-step word problems involving whole numbers, decimals, and fractions using addition, subtraction, multiplication, and division.</td>
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<tr>
<td>06-10-25-SY</td>
<td>Synthesis</td>
</tr>
<tr>
<td>06-10-25-SY-08</td>
<td>The student will draw diagrams, use trial and error, logical reasoning, and locate patterns to solve problems.</td>
</tr>
<tr>
<td>06-10-30</td>
<td>The student will be able to identify the following polygons: square, rectangle, equilateral triangle, isosceles triangle, scalene triangle, right triangle, parallelogram, rhombus, quadrilateral, trapezoid, pentagon, hexagon, and octagon.</td>
</tr>
<tr>
<td>06-10-30-AN</td>
<td>Analysis</td>
</tr>
<tr>
<td>06-10-30-AN-03</td>
<td>The student will identify angles by their measures and measure and draw angles of a given measure using a protractor.</td>
</tr>
<tr>
<td>06-10-30-AN-04</td>
<td>The student will measure the angles of a triangle, classify triangles by their angle measures, and find missing angle measures.</td>
</tr>
<tr>
<td>06-10-30-AN-05</td>
<td>The student will identify the following polygons: squares, rectangles, equilateral, scalene, isosceles, and right triangles, parallelograms, rhombuses, quadrilaterals, trapezoids, pentagons, hexagons, and octagons.</td>
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<tr>
<td>06-10-30-KH</td>
<td>Knowledge</td>
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<td>06-10-30-KH-01</td>
<td>The student will identify points, lines, planes, segments, rays, intersecting lines, and parallel lines.</td>
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| 06-10-31 | The student will be able to analyze polygons to determine
### Elementary Mathematics

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<td>06-10-31</td>
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<tr>
<td>06-10-31-AN</td>
<td>Analysis</td>
</tr>
<tr>
<td>06-10-31-AN-02</td>
<td>The student will identify congruent figures and lines of symmetry in figures.</td>
</tr>
<tr>
<td>06-10-31-AN-06</td>
<td>The student will analyze polygons to determine if they have parallel sides, perpendicular sides, lines of symmetry, and congruent sides.</td>
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<tr>
<td>06-10-32</td>
<td>The student will be able to measure and calculate the perimeter of polygons.</td>
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<td>06-10-32-AN</td>
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<td>06-10-32-AN-07</td>
<td>The student will find the perimeter, area, and volume of polygons and prisms by measuring and using formulas.</td>
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<td>06-10-32-AP</td>
<td>Application</td>
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<td>06-10-32-AP-10</td>
<td>The student will identify center, radius, diameter, and circumference of a circle.</td>
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**Total Curriculum Statements Printed:** 234
APPENDIX D.

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<th>Gilbert Test Items</th>
<th>SIM Test Item</th>
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Subject: 

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Subject: ____________

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<th>Desired</th>
<th>Gilbert Test Items</th>
<th>SIM Test Items</th>
<th>Need to Write</th>
<th>Gilbert Elementary Plan of Action</th>
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<td>Subtraction of Decimals</td>
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<td>Program Goal: The learner</td>
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<td>Yes</td>
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<td>will be able to understand the operation &amp; use the properties of addition with real numbers</td>
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<td>the meaning of decimals through hundredths</td>
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<td>Mastery: Addition</td>
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<td>The learner will: Read, write, compare, &amp; order decimals to hundred thousandths</td>
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<td>problems by choosing addition or subtraction of decimals</td>
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Subject: Mathematics
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APPENDIX E.

CURRICULUM AND EVALUATION STANDARDS
FOR SCHOOL MATHEMATICS GRADES FIVE THROUGH EIGHT
Standard 1: Mathematics as Problem Solving

In grades 5-8, the mathematics curriculum should include numerous and varied experiences with problem solving as a method of inquiry and application so that students can -

- use problem-solving approaches to investigate and understand mathematical content;
- formulate problems from situations within and outside mathematics;
- develop and apply a variety of strategies to solve problems, with emphasis on multistep and non-routine problems;
- verify and interpret results with respect to the original problem situation;
- generalize solutions and strategies to new problem situations;
- acquire confidence in using mathematics meaningfully.

Standard 2: Mathematics as Communication

In grades 5-8, the study of mathematics should include opportunities to communicate so that students can -

- model situations using oral, written, concrete, pictorial, graphical, and algebraic methods;
- reflect on and clearly their own thinking about mathematical ideas and situations;
- develop common understandings of mathematical ideas, including the role of definitions;
- use the skills of reading, listening, and viewing to interpret and evaluate mathematical ideas;
- discuss mathematical ideas and make conjectures and convincing arguments;
- appreciate the value of mathematical notation and its role in the development of mathematical ideas.
Standard 3: Mathematics as Reasoning

In grades 5-8, reasoning shall permeate the mathematics curriculum so that students can -

- recognize and apply deductive and inductive reasoning;
- understand and apply reasoning processes, with special attention to spatial reasoning and reasoning with proportions and graphs;
- make and evaluate mathematical conjectures and arguments;
- validate their own thinking;
- appreciate the pervasive use and power of reasoning as a part of mathematics.

Standard 4: Mathematical Connections

In grades 5-8, the mathematics curriculum should include the investigation of mathematical connections so that students can -

- see mathematics as an integrated whole;
- explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations;
- use a mathematical idea to further their understanding of other mathematical ideas;
- apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as art, music, psychology, science and business;
- value the role of mathematics in our culture and society.

Standard 5: Number and Number Relationships

In grades 5-8, the mathematics curriculum should include the continued development of number and number relationships so that students can -

- understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific notation) in real-world and mathematical problem situations;
- develop number sense for whole numbers, fractions, decimals, integers, and rational numbers;
- understand and apply ratios, proportions, and percents in a wide variety of situations;
- investigate relationships among fractions, decimals, and percents;
- represent numerical relationships in one- and two-dimensional graphs.
Standard 6: Number Systems and Number Theory

In grades 5-8, the mathematics curriculum should include the study of number systems and number theory so that students can -

- understand and appreciate the need for numbers beyond the whole numbers;
- develop and use order relations for whole numbers, fractions, decimals, integers, and rational numbers;
- extend their understanding of whole number operations to fractions, decimals, integers, and rational numbers;
- understand how the basics arithmetic operations are related to one another;
- develop and apply number theory concepts (e.g., primes, factors, and multiples) in real world and mathematical problem situations.

Standard 7: Computation and Estimation

In grades 5-8, the mathematics curriculum should develop the concepts underlying computation and estimation in various contexts so that students can -

- compute with whole numbers, fractions, decimals, integers, and rational numbers;
- develop, analyze, and explain procedures for computation and techniques for estimation;
- develop, analyze, and explain methods for solving proportions;
- select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil, calculator, and computer methods;
- use computation, estimation, and proportions to solve problems;
- use estimation to check the reasonableness of results.

Standard 8: Patterns and Functions

In grades 5-8, the mathematics curriculum should include explorations of patterns and functions so that students can -

- describe, extend, analyze, and create a wide variety of patterns;
- describe and represent relationships with tables, graphs, and rules;
- analyze functional relationships to explain how a change in one quantity results in a change in another;
- use patterns and functions to represent and solve problems.
Standard 9: Algebra

In grades 5-8, the mathematics curriculum should include explorations of algebraic concepts and processes so that students can -

- understand the concepts of variable, expression, and equation;
- represent situations and number patterns with tables, graphs, verbal rules, and equations and explore the interrelationships of these representations;
- analyze tables and graphs to identify properties and relationships;
- develop confidence in solving linear equations using concrete, informal, and formal methods;
- investigate inequalities and nonlinear equations informally;
- apply algebraic methods to solve a variety of real-world and mathematical problems.

Standard 10: Statistics

In grades 5-8, the mathematics curriculum should include exploration of statistics in real-world situations so that students can -

- systematically collect, organize, and describe data;
- construct, read, and interpret tables, charts, and graphs;
- make inferences and convincing arguments that are based on data analysis;
- evaluate arguments that are based on data analysis;
- develop an appreciation for statistical methods as powerful means for decision making.

Standard 11: Probability

In grades 5-8, the mathematics curriculum should include explorations of probability in real-world situations so that students can -

- model situations by devising and carrying out experiments or simulations to determine probabilities;
- model situations by constructing a sample space to determine probabilities;
- appreciate the power of using a probability model by comparing experimental results with mathematical expectations;
- make predictions that are based on experimental or theoretical probabilities;
- develop an appreciation for the pervasive use of probability in the real world.
Standard 12: Geometry

In grades 5-8, the mathematics curriculum should include the study of the geometry of one, two, and three dimensions in a variety of situations so that students can -

- identify, describe, compare, and classify geometric figures;
- visualize and represent geometric figures with special attention to developing spatial sense;
- explore transformations of geometric figures;
- represent and solve problems using geometric models;
- understand and apply geometric properties and relationships;
- develop an appreciation of geometry as a means of describing the physical world.

Standard 13: Measurement

In grades 5-8, the mathematics curriculum should include extensive concrete experience using measurement so that students can -

- extend their understanding of the process of measurement;
- estimate, make, and use measurements to describe and compare phenomena;
- select appropriate units and tools to measure to the degree of accuracy required on a particular situation;
- understand the structure and use of systems of measurement;
- extend their understanding the concepts of perimeter, area, volume, angle measure, capacity, and weight and mass;
- develop the concepts of rates and other derived and indirect measurements;
- develop formulas and procedures for determining measures to solve problems.
APPENDIX F.

GILBERT ELEMENTARY SCHOOL REPORT CARD
Gilbert Elementary School
109 Rothmoor Drive
Gilbert, Iowa 50105
328
David Ashby, Principal
515-232-3744

CALENDAR
Apr. 20..................2:05 p.m. Early Dismissal
Apr. 26..................4th, 5th, & 6th Concert
May 11..................2:05 p.m. Early Dismissal
May 29..................H.S. Commencement
May 39..................No School Memorial Day
June 1..................4th, 5th, & 6th Track Meet
June 7..................Last Day of Classes

REPORT CARD

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APPENDIX G.

HUMAN SUBJECTS RELEASE LETTER FROM DOUGLAS WILLIAMS,
SUPERINTENDENT OF GILBERT COMMUNITY DISTRICT
December 20, 1993

Dr. Richard P. Manatt, Director
School Improvement Model
Iowa State University
2926 Monroe Dr.
Ames, Iowa 50010

Dear Dr. Manatt:

This memorandum grants you permission to use Gilbert Community School District student feedback data for conducting analysis of same for District purposes.

You also are authorized to use such data, assign such data, and to have analyzed such data, for use in dissertations by appropriate candidates under your supervision.

Sincerely,

Douglas C. Williams
Superintendent of Schools

DCW/bc